TWENTY-FIFTH YEAR

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

Vol. XXV. No. 11.
$2.00 a year. 30 cents a copy.

NOVEMBER, 1928

Heating & Ventilating Magazine Co.
386 Fourth Avenue, New York.

Another MODINE Achievement

MODEL 1401
The new Modine Unit—equivalent of 1300 ft. of c. i. radiation — weighs only 300 lbs. — suspends from the steam line.

This larger Unit Heater with all the features of smaller models —

A NEW Modine — Model 1401 — the equivalent of thirteen hundred square feet of cast iron radiation—with all the outstanding features for heat directional control found in smaller Modines.

Consider the economies this new unit effects. Space saving—four tons of cast iron occupy considerable floor and wall space; the 1401 Modine, suspending from the steam main and weighing only 300 lbs. occupies none. Heating effectiveness — Modine Unit Heaters deliver heated air throughout the working area—down to the floor. True heat distribution. Productive heat. Compare such performance with other methods, where heat is banked at the ceiling.

Then consider the other Modine features. Complete directional control of heated air, horizontally and vertically; individual operation of each unit — switch them on as temperature demands; ease of installation; and above all, low installation cost. And, you have an ideal industrial heating system.

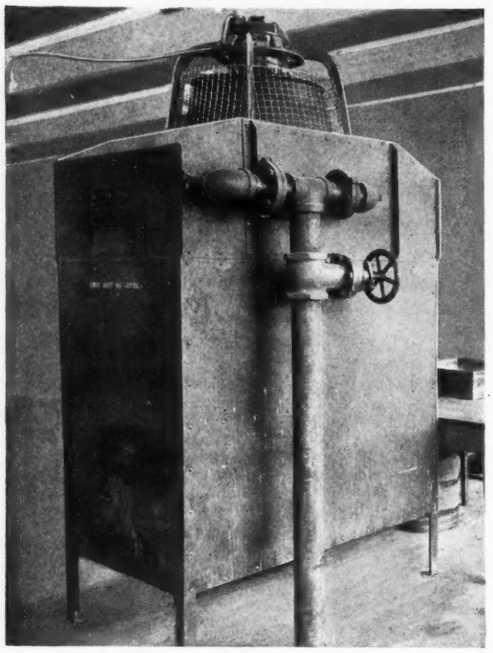
Let us send you full information today. Write for Catalog No. 628 describing Modine Unit Heaters, including the new No. 1401.

MODINE MANUFACTURING COMPANY
(Heating Division)
1707 Racine Street Racine, Wisconsin
Branch Offices in All Large Cities
London Office: S. G. Leach & Co., Ltd., 26-30 Artillery Lane

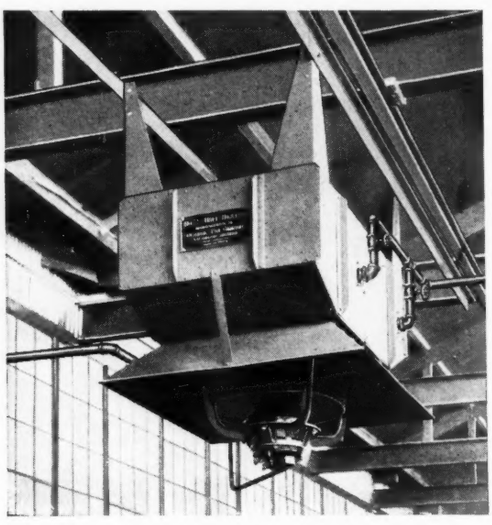
Modine *Unit* HEATER
A MODINE Product
FOR STEAM-VAPOR, VACUUM, HOT WATER HEATING SYSTEMS

HEAT

distributed evenly ~ No overheating one part, attempting to warm the rest of the building.

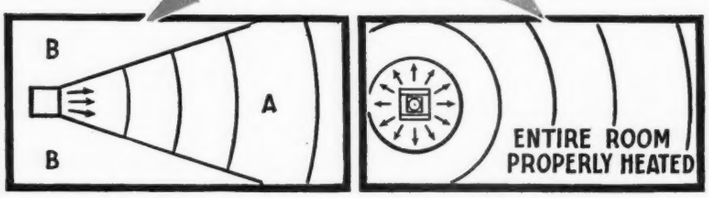


Floor Type Unit Heater installed in paper mill.



Ceiling Type Unit Heater installed in automotive plant.

[Note!]



Customary Method:—Only section A in direct path of heat travel; section B outside.

Clarage Method:—Entire room uniform temperature; warm air delivered 'round-the-circle.

WHY are Clarage Unit Heaters so highly desirable for industrial application? The answer is simple—plain as day—easy to understand. Note the diagrams above.

Clarage Unit Heaters, and only Clarage Unit Heaters, deliver warm air 'round-the-circle—have no cold sides. With this equipment, heat is discharged at high velocity in all horizontal directions and straight from the fan.

Therefore, no part of your building lies outside the direct path of heat travel; therefore, no need to overheat some parts to warm the rest. Clarage 'round-the-circle distribution provides equal heat for every nook and corner. Uniform, agreeable temperatures are easily maintained—maximum economies effected.

Clarage Unit Heaters are built for either floor or ceiling installation as shown—three sizes to meet all factory and garage requirements where steam or hot water is available. Write for literature, or consult with our engineers—No obligation.

CLARAGE FAN COMPANY
KALAMAZOO, MICHIGAN

Sales Engineering Offices in Principal Cities

CLARAGE
UNIT HEATERS

with AEROFIN STANDARD EQUIPMENT

All Clarage Unit Heaters utilizing steam or hot water have Aerofin (The Standardized Light Weight Heater) as the heating element. Aerofin is made of copper and brass—non-corrosive, imperishable, light-weight. It is highly efficient, guaranteed steam and water tight. Engineers endorse it.

KEWANEE STEEL BOILERS

Lower Heating Costs

The "Down Draft" *Fire*—draws freshly distilled gases down from the *green* fuel thru the red hot bed of coals so they are completely ignited.

Smoke is unconsumed fuel. A Kewanee Down Draft Boiler is economical because it *is really smokeless.* It burns all the fuel completely, instead of wasting it.

With a downdraft grate the volatile matter is pulled down away from the cooler fuel into the hottest part of the furnace where it is readily consumed.

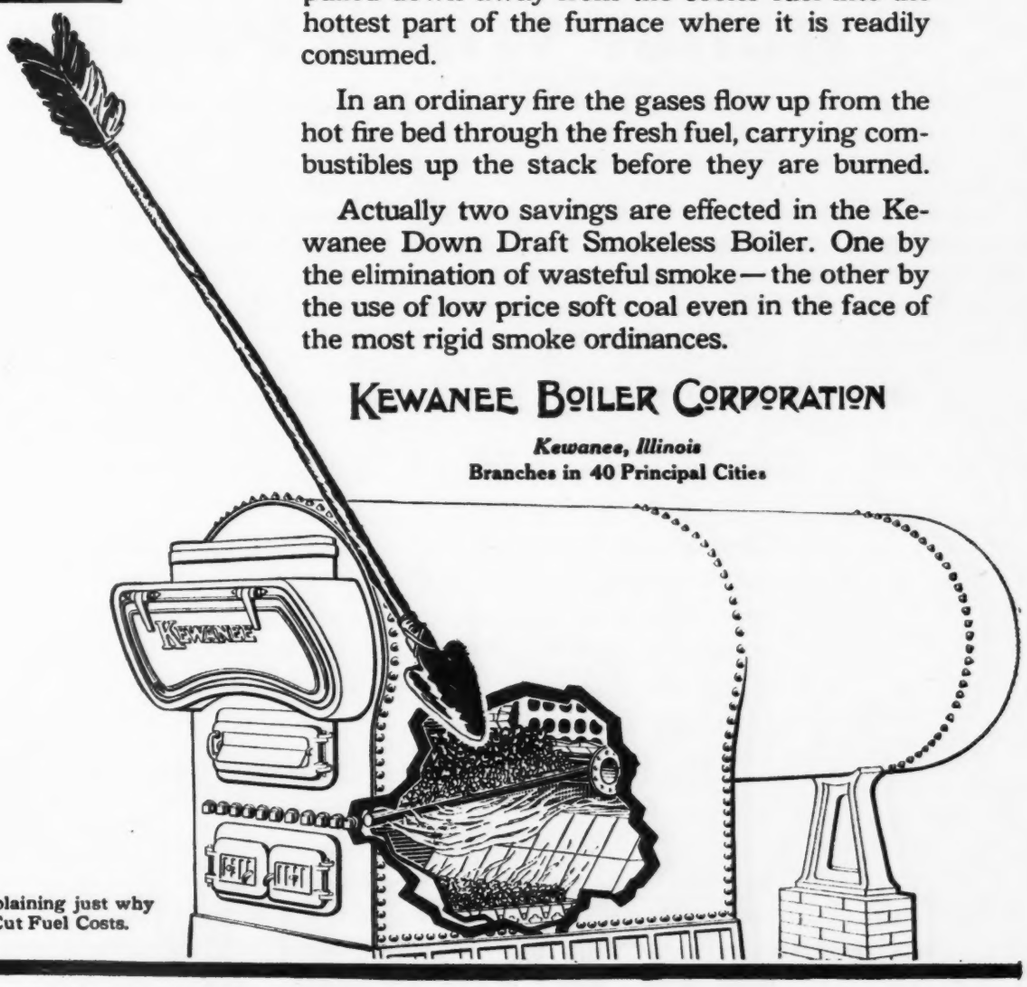
In an ordinary fire the gases flow up from the hot fire bed through the fresh fuel, carrying combustibles up the stack before they are burned.

Actually two savings are effected in the Kewanee Down Draft Smokeless Boiler. One by the elimination of wasteful smoke—the other by the use of low price soft coal even in the face of the most rigid smoke ordinances.

KEWANEE BOILER CORPORATION

Kewanee, Illinois

Branches in 40 Principal Cities



Sixth of a Series—explaining just why Kewanee Boilers Cut Fuel Costs.

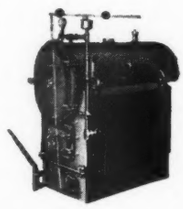
THE HEATING AND VENTILATING MAGAZINE, published by THE HEATING AND VENTILATING MAGAZINE CO., at 386 Fourth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXV, No. 11, November, 1928. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

The First Welded Steel Boiler Was a Pacific

Nearly sixteen years ago this organization introduced the electrically welded steel heating boiler. This new construction method was applied to a boiler design founded on rock-bottom heating principles which today are responsible for Pacific's remarkable record of efficiency and economy in actual service.

With the exception of a few minor changes in details, the Pacific Steel Heating Boiler of 1928 closely follows the original design. It was sound then — it is sound now. The fact that Pacific Boilers lead the field in the number of welded boilers sold each year is proof beyond question.

One of our representatives will gladly explain the construction features which have built Pacific prestige. Or, if you prefer to see these features translated into performance, we have some actual operating records of typical installations which speak for themselves.



PACIFIC STEEL BOILER CORPORATION
Waukegan, Ill., Bristol, Pa.
Sales Offices in 58 Cities
Division of U. S. Radiator Corp., Detroit, Mich.

PACIFIC
STEEL HEATING BOILERS

Fire burns up-hill - Coal rolls down

Before America was discovered, the Indians signalled with fires that sent smoke skyward. Even a savage knows that fire burns up. In a Spencer Heater is the most modern application of that well-known scientific fact. Spencer Gable-Grates are sloped to make fire burn up-hill, the way it burns best.

Coal at the mine is chuted *down* from tipple to railway car. At your home it is chuted *down* from truck to cellar bin. In the Spencer Heater, it is chuted *down* from a storage Magazine to Gable-Grates, with the automatic slow flow feed that saves time, trouble and half your annual fuel bill.

Make those scientific facts make money for you

When you depend upon competitive bidding to get heating business, you put all your eggs in one basket. Everybody bids on practically the same material. Someone who is just a dollar or two lower than you will get the business.

You can give yourself a double opportunity to get more business—with more profit, too—by submitting an alternative bid on a Spencer Heater with every bid you make. In any case, whether you are high, low, or just the same as others, your bid stands out above competition, for you offer your customer a saving in actual dollars that is not possible with other heaters.

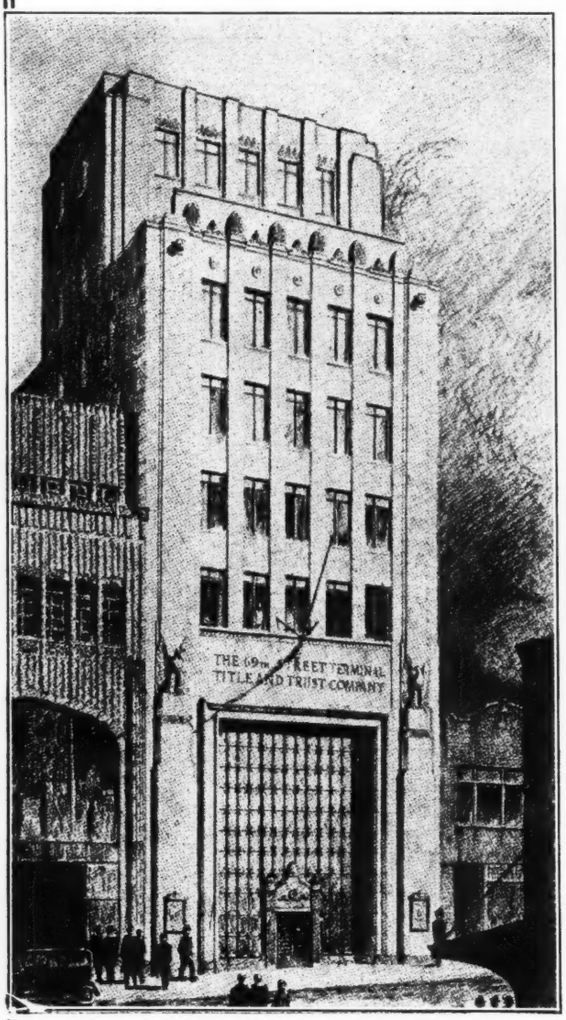
SPENCER
steam, vapor or hot water
HEATERS

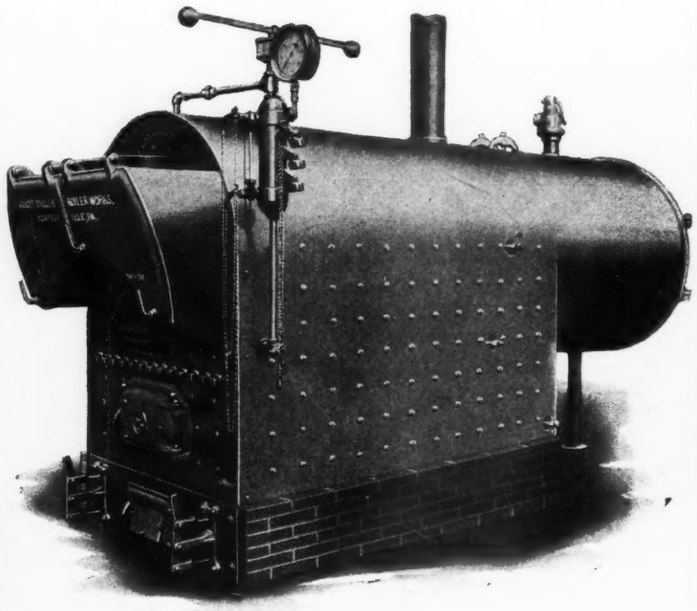
You get more chance to talk with prospects, and you have something real to talk about. Home and building owners are glad to install a Spencer when you tell them how much it saves. You know how a Spencer saves. Tell that to your prospects. Tell them that the Spencer is made with a storage Magazine and sloping Gable-Grates that make fire burn up-hill. That is why a Spencer burns, efficiently, small sizes of fuel, like No. 1 Buckwheat anthracite and Pea or Buckwheat coke.

Show prospects how much this will save. Explain that No. 1 Buckwheat anthracite, for instance, costs an average of $6.00 less than egg, stove and nut sizes. The Spencer gets just as much heat value from these low-cost, small sizes, as ordinary heaters get from more expensive sizes. That is why the Spencer saves all the difference in price per ton—as much as half the annual fuel bill.

Tell prospects this, and you'll be surprised to find how often they will want to pay the slightly higher first cost of a Spencer for the saving that it makes. That is where you make more profit. Because it does cost more, you get a larger sale with larger profits—and you get all your profit too, for you don't whittle profits down to nothing in competitive bidding.

Write for the new Spencer Co-operative Selling Plan. Many practical heating contractors are already using it to make more sales and better profits. Spencer Heater Company, *Division of Lycoming Manufacturing Company*, Williamsport, Pa.





Another New Building will be heated by a COATESVILLE ALL-STEEL HEATING BOILER

When the new bank and office building of the 69th Street Terminal Title & Trust Company was being designed the architects and engineers wanted to install reliable heating equipment. They chose a Coatesville all-steel portable fire box H. R. T. Boiler, thus following the precedent set in the design of a number of well known and modern structures.

The General Contractors were Roberts & Roller,—the Architects, Ritter & Shay, and the Heating Contractor, R. Kauffman—all of Philadelphia.

We have prepared a new Series of ALL-STEEL HEATING BOILER BULLETINS, and if you will tell us your particular requirement, we'll be glad to send you the proper Bulletin and full details.

Coatesville All-Steel Heating Boilers are the embodiment of nearly 50 Years of Boiler Making Experience — in fact, Coatesville was one of the first concerns to produce a Boiler of this type back in 1892.

Manufactured by

COATESVILLE BOILER WORKS, COATESVILLE, PA.

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Cincinnati, Ohio—Spring Grove and Elmira Avenue | Pittsburgh, Pa.—1509 Arrott Building
Indianapolis, Ind.—431 W. Georgia Street | Johnstown, Pa.—221 Central Ave. | Richmond, Va.—3032 Norfolk St. | St. Louis, Mo.—1042 Central Industrial St.
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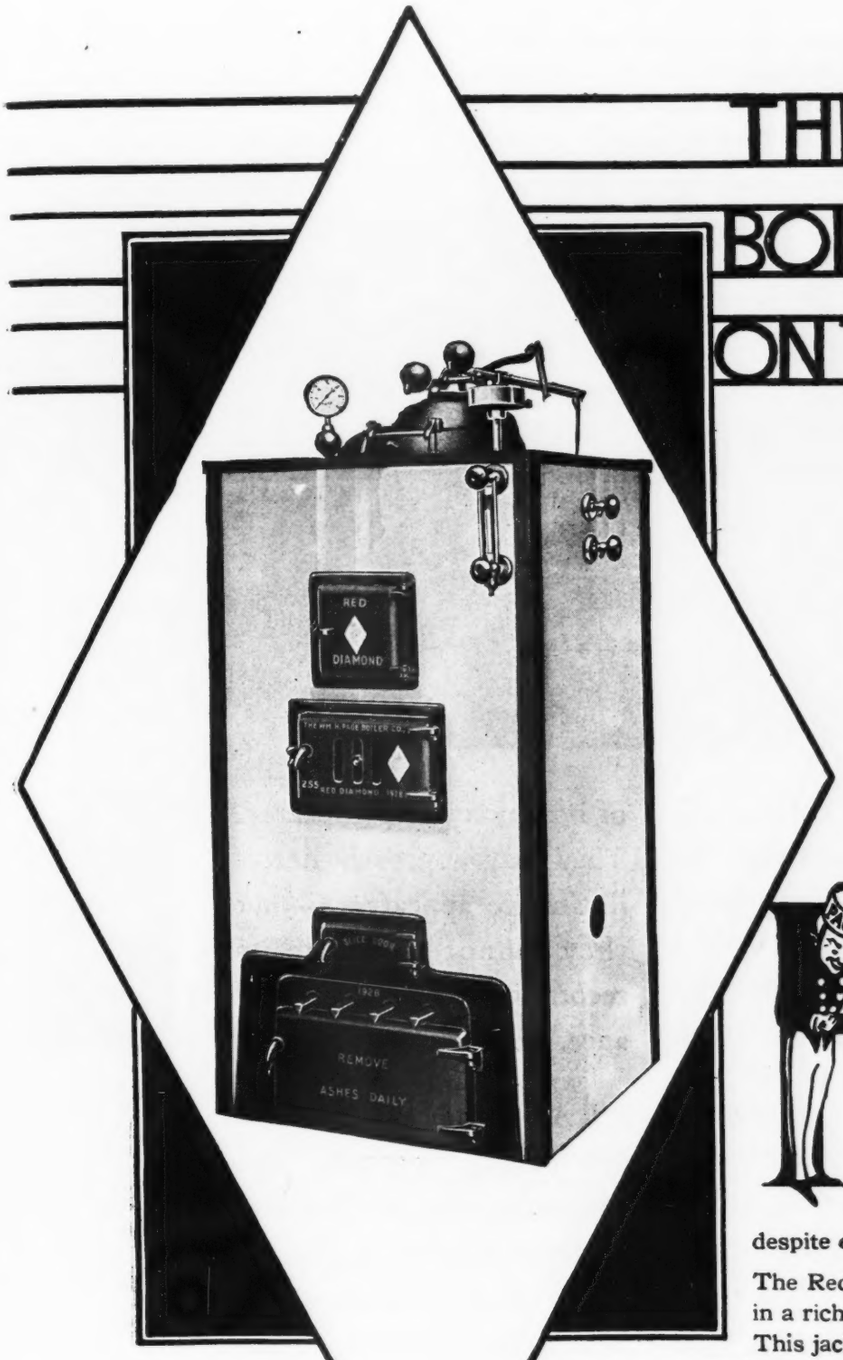
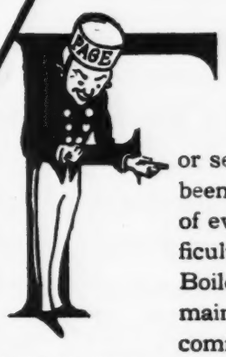
THE ROUND BOILER THAT'S ON THE SQUARE





For seventy years Page Boilers have been successfully heating buildings of every sort. No matter how difficult the situation has been Page Boilers have sufficient capacity to maintain easily and consistently a comfortable temperature indoors, despite extreme cold outside.

The Red Diamond Boiler is the Page round boiler in a rich lustrous red, baked enamel finished jacket. This jacket, lined with 1¼" improved air cell asbestos, is easy to look at, and provides highly efficient insulation as well.

Your clients will be interested, particularly since the price is right.

Send for pamphlet 54-A.

The Wm H Page Boiler Co

Branch Offices and Warehouses:

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Factory: Meadville, Penna.

General Offices: 200 Madison Avenue, New York City

FOR six years Aero, the National Radiator, has been warming buildings of all types throughout the United States, Canada, and foreign countries — demonstrating the soundness of the engineering principles on which it is constructed, and building an ever increasing group of satisfied customers.

Today Aero is truly "the National Radiator." A host of imitations have appeared. They may approach Aero's distinctive appearance—but they cannot duplicate its record of proved performance. Aero is years ahead.

Sell Aero Radiation, and you sell beauty, warmth, and efficiency. Aero, the National Radiator, retains its place as leader in attractiveness and health-giving comfort.

NATIONAL RADIATOR CORPORATION

MANUFACTURER OF RADIATORS AND BOILERS

Nine Plants devoted to National Service through these Branch Offices and Warehouses:

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Cincinnati, O.—Spring Grove & Elmira Ave.
Indianapolis, Ind.—431 W. Georgia St. Johnstown, Pa.—221 Central Ave.
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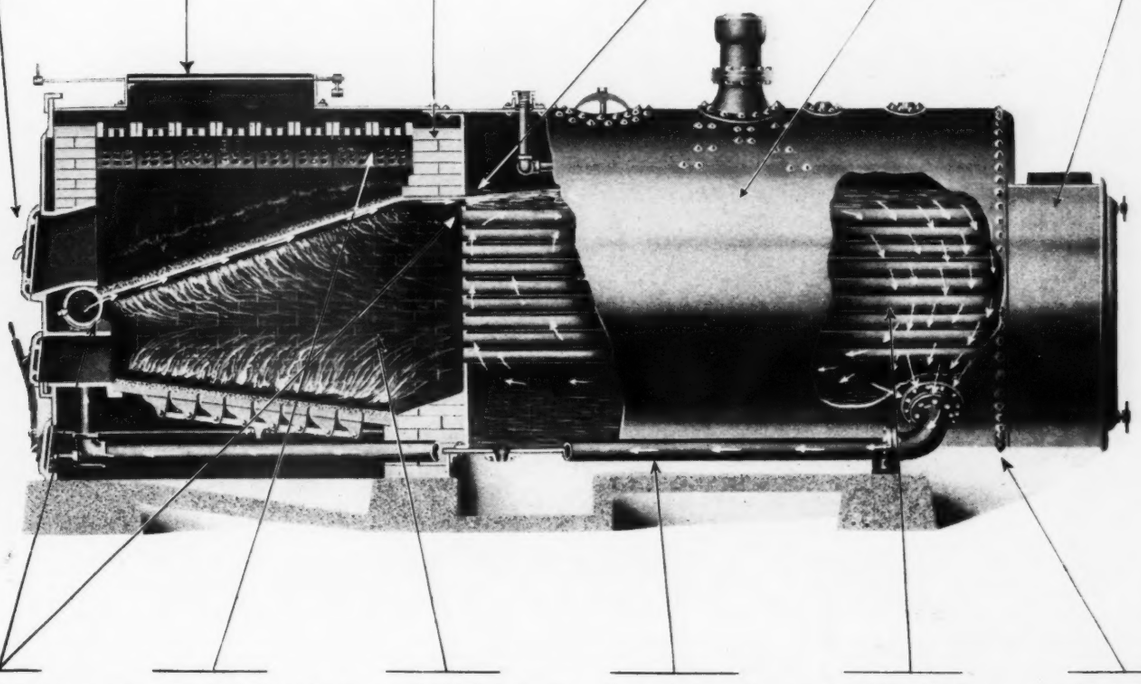
Philadelphia, Pa.—121 N. Broad St. Pittsburgh, Pa.—1509 Arrott Bldg
Richmond, Va.—3032 Norfolk St.
St. Louis, Mo.—1042 Central Industrial Ave. Washington, D.C.—2205 Fifth St., N.E.

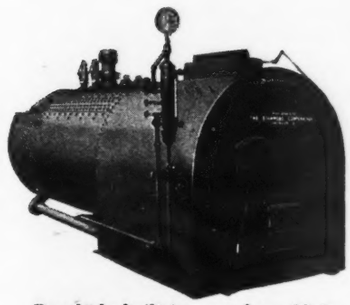
AERO THE NATIONAL RADIATOR

NATIONAL PRODUCTS

This investigation proved Stanwood's *superiority!*


1—Fire doors at correct height for firing with minimum fatigue. Doors hung at angle —stay shut when closed.
2—Longitudinal damper affords even distribution of air on top grate. Closes absolutely tight when shut.
3—Minimum amount of bricking required inside boiler — NONE outside. Standard bricks; available everywhere.
4—Exceedingly low water line, 48 to 75 inches, depending upon size of boiler. Little excavating necessary.
5—No air leaks. Steel boiler shell. No radiation losses. Nothing to absorb heat but rapidly passing water inside.
6—Smokebox extension at rear permits quick inspection and easy cleaning.
7—Water grate tubes are expanded at BOTH ends (not screwed) Ample room behind header to accomplish this.
8—Air enters intake, is pre-heated by passing through perforated, cast iron arches before reaching fuel bed.
9—Complete fuel combustion thru down draft furnace contributing to smokeless feature of boiler.
10—Rapid water circulation — prevents sediment settling and keeps flue gas temperature low. Affords quick steaming.
11—Design of water circulation permits rapid movement of water at back end of boiler.
12—Note riveted steel construction—costliest and best form of fabrication. Essential to pressure boilers.

More efficient—more reliable!



Regularly built in sizes from 29 to 250 H.P. (3500 to 31000 sq. ft. steam radiation) for working pressures of 15, 100, 125 and 150 lbs. Built for higher pressures if desired

Hundreds of installations in all kinds of heating plants have proven Stanwoods's superiority by unusual savings in operation and maintenance.

Features not visible in the illustration are: (1) Elimination of mudlegs and staybolts which retard water circulation and allow sediment, silt and dirt to collect. (2) The compactness permits installation in three to four days. (3) Front swings open like a door to permit easy cleaning. (4) Quick steaming ability and (5) No crown sheets to bag and burn.

Learn more about these definite, tangible features of boiler superiority. Mail the coupon for pamphlets describing the Stanwood Boiler.

The STANWOOD CORPORATION

Manufacturers also of Horizontal Return Tubular Boilers, Stacks, Breechings, and Tanks.

Cincinnati Ohio

Est. 1891

Get the Facts

THE STANWOOD CORPORATION
Dept. D-118, Cincinnati, O.

Please send me full details of the Stanwood Boiler.....H.P.....Pressure.

Name .....

Address .....

Stanwood *Smokeless* Boilers

TWO TITUSVILLE HEATING BOILERS

are installed in the new Montauk Manor Hotel on Long Island, New York.

IT goes without saying that an ultra-smart hotel catering to a critical patronage *must have* ultra-modern equipment throughout. Correct and efficient heating is especially vital. ¶It is therefore significant indeed that two Titusville Firebox Boilers for oil burning were chosen for this important duty of maintaining uniform comfort during those cold Long Island winters in the Montauk Manor Hotel shown above. ¶It reflects a nationwide confidence among many leading heating engineers, contractors and architects for Titusville Boilers based on their excellent past record. ¶Why not let us acquaint *you* with the advantages of this equipment?

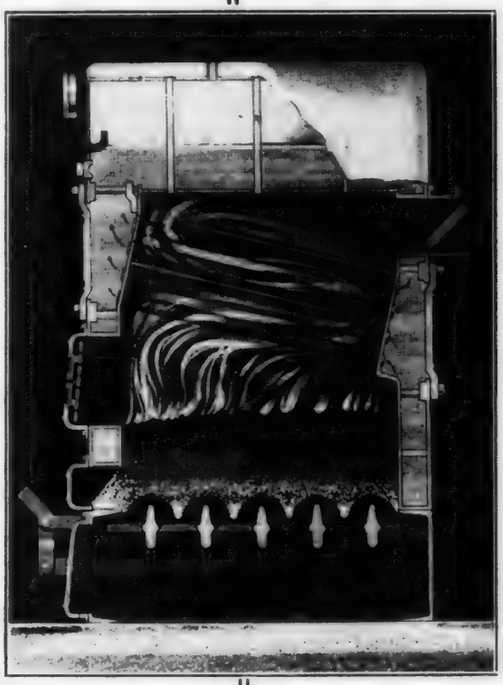
THE TITUSVILLE IRON WORKS COMPANY

Titusville, Pennsylvania

SALES OFFICES: New York, 152 W. 42nd St.; Chicago, Ill., 111 W. Monroe St.; Detroit, Mich., 204 Owen Bldg.; Buffalo, N. Y., Marine Trust Bldg.; Washington, D. C., 626 Woodward Bldg.; Cleveland, O.; 118 St. Claire, East Cleveland, O.; Pittsburgh, Pa. Farmers Bank Bldg.; Charlotte, N. C., 705 Realty Bldg.; Los Angeles, Calif., 940 Maple Ave.; St. Louis, Mo., 401-2 Bank of Commerce Bldg.

KNOWLTON WATERTOOB STEEL BOILERS

Use Coal in Knowlton "Watertoob" Boilers



Then you will have complete satisfaction in—economy—rapidity of heating—attention. The "Copper" water tube construction does it.

Write for booklet "Complete Heating Satisfaction" which tells the rest of the KNOWLTON *Story.*

ORR & SEMBOWER, Inc.

Reading, Pennsylvania

(Established 1885)

208 N. Clinton St., CHICAGO 50 Church St., NEW YORK

The BETTER BUCKWHEAT BURNER

What the Users Say

"It generates steam very quickly, and we are free of the trouble of leaks at joints, which was the case in a boiler used before. Apparently the tubes in your boiler take care of this very rapid expansion and contraction of sudden intense heat and the instantaneous shutting off of the burner."

"We have in one instance been able to cut a man's fuel bill almost 50% after changing to a Coil Boiler."

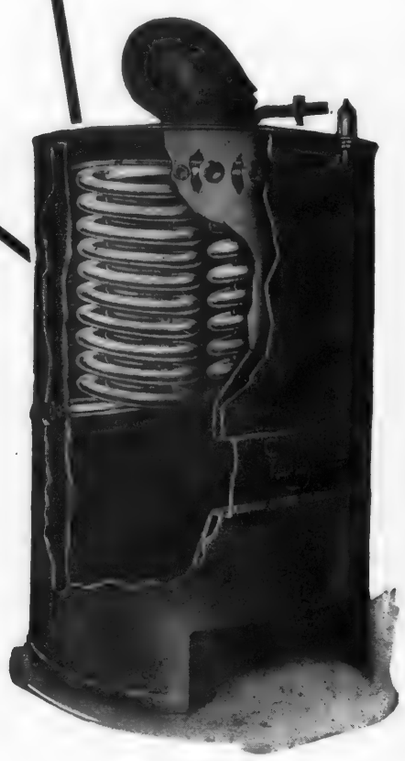
"I installed an Oil Burner in your Boiler and kept my home of ten rooms (900 ft. water radiation) at an even temperature day and night during the past winter at a cost of about $130.00 for fuel oil."

for perfect economical heat

COIL

STEEL HEATING BOILERS AND WATER HEATERS

FOR OIL BURNING



If desirable, Coil Oil Burning Boilers can be fitted with grates, shaking apparatus, etc., in thirty minutes' time.

WRITE FOR CATALOG

MONITOR BOILER COMPANY

1505 RACE ST., PHILADELPHIA, PA.

ROSS STEEL BOILERS

Leonard Willeke residence,
Grosse Pointe Village,
Detroit, Michigan.
McConachie & Reid,
Heating Contractors.

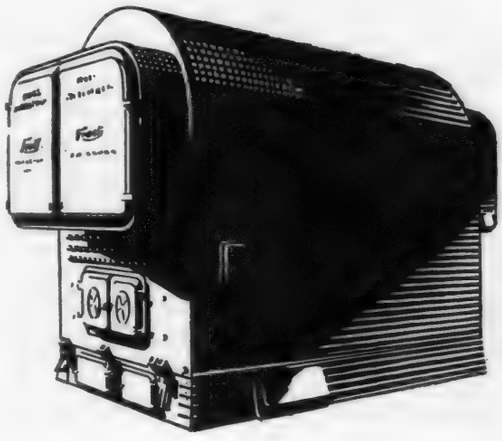
Rufus Clark residence,
Grosse Pointe Village.
Detroit, Michigan.
H. Buckeridge & Son,
Heating Contractors.

Oscar Webber residence, Grosse Pointe Shores, Detroit, Michigan
Harrigan & Reid, Heating Contractors.

The above photographs represent the type of homes that find ROSS STEEL HEATING BOILERS entirely satisfactory . . . . . .

The Frost Manufacturing Co.
SINCE 1851

Branches in most leading cities. GALESBURG, ILLINOIS



BUILDING WONDERS NEVER CEASE

OUT beyond the harbor a deep toned whistle announces the approach of a great ocean liner racing for her port, with a new trans-Atlantic record . . . overhead the roar of powerful motors signals the conquest of the air . . . in the studio the click of a switch sends a radio message around the globe . . . this is the day of speed . . . of wonders . . . of progress unrestrained.

In the midst of these bewildering changes, great towering structures rise along the avenues of America's leading cities . . . others are being planned . . . each one seems more beautiful, more enduring, more wonderful. The genius of the modern architect and the skill of his plans will stand as wonders of this age; for while he brings forth a new interpretation of beauty and charm he has endowed his creations with enduring qualities. There has been no compromise with dependability in the selection of materials used—only products of acknowledged leadership entered these magnificent edifices.

The pipe lines . . . the very arteries of these great structures . . . how necessary that they should efficiently perform . . . that they should not fail. Underneath floors and behind walls, they silently and faithfully carry on . . . meeting the increasing demands of passing years, that service shall endure.

The New York Life Building, illustrated, is another addition to the long list of America's superstructures whose major pipe tonnage is "NATIONAL"—The Recognized Standard for Building Purposes.

NATIONAL TUBE COMPANY
PITTSBURGH, PA.

NEW YORK LIFE INSURANCE CO. BUILDING
NEW YORK CITY
Architect: Cass Gilbert
General Contractors: Starrett Brothers
Heating Contractors: Baker, Smith & Co. Inc.
Plumbing Contractors: W. G. Cornell Co.
NATIONAL

TAKE A TIP

FROM THE UNITED STATES BUREAU OF STANDARDS

Beauty of design is only one attribute of the "Richmond" Radiator

TESTS of certain Richmond Radiators by the United States Bureau of Standards established much higher ratings than those published by us. In some instances the ratings are 8½% greater than our own, based on condensation tests in terms of B. T. U. ¶ In Richmond Radiators you get the value of 105 to 110 square feet of radiation at a cost of 100 square feet. This is a mighty important factor in competitive estimating. ¶ The straight, simple lines, the larger air spaces, the absence of obstructions to heat radiation—these features are accountable for the remarkable beauty and efficiency of Richmond Radiators. Write for detailed report of tests and data.

RICHMOND RADIATOR COMPANY

INCORPORATED

1480 BROADWAY, NEW YORK

Gas Boiler Division, 2220 Chestnut St., Philadelphia, Pa.

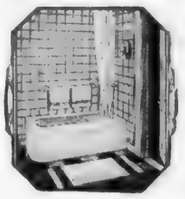
Branch Offices: Chicago Philadelphia Boston Cleveland

Factories | Heatomat—Enameled Ware—Radiators . . UNIONTOWN, PA.
| Steam and Hot Water Boilers . . . . . NORWICH, CONN.

When you specify "RICHMOND" you specify satisfaction

All RICHMOND products, boilers, radiators and enameled ware are unexcelled for high quality of material and mechanical perfection.

RICHMOND ENAMELED WARE



A quality line of enameled ware for kitchen, bathroom, and laundry. The Richmond label and guarantee are back of every product. A complete catalog sent upon request.

RICHMOND STEAM AND HOT WATER BOILERS

A complete line of all styles and models for all types of buildings. Designed to operate with maximum efficiency and minimum of attention.

RICHMOND HEATOMAT GAS BOILER

New low prices as the result of increased production are now in effect. Models for homes, apartment houses and commercial buildings. Write for catalogs and details of cooperative test sales plans.

RICHMOND RADIATOR COMPANY
1480 Broadway, New York

You may send me catalogs and details of the items checked.

.....Steam & Hot Water Boiler .....Radiators
.....Heatomat Gas Boiler .....Enameled Ware

Name .....

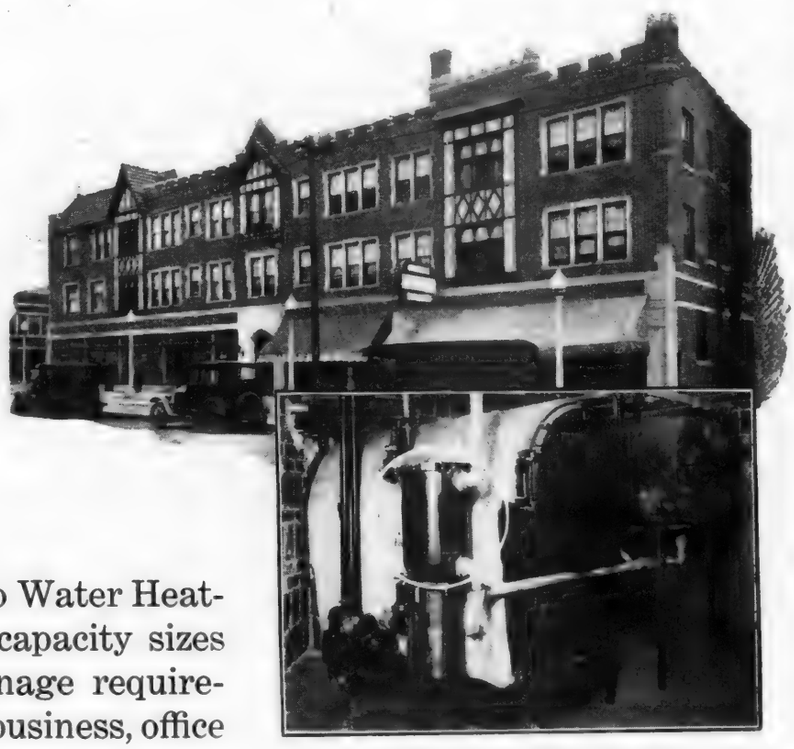
Address .....

H.V. 11

BIG SIZES

(Double and Triple Coil Heaters)

To Supply HOT WATER for Big Buildings



THE well known Excelso Water Heaters are built in large-capacity sizes to amply supply the gallonage requirements of apartment, hotel, business, office and factory buildings.

They are easily and quickly connected to round, sectional or tubular boilers using the regular system of piping and tank. They work with any fuel—coal, gas or oil; in any season, summer and winter.

Booklet of complete information and diagrams of fourteen typical installations, sent to engineers, contractors or tradesmen to help them easily sell and install the Excelso.

Connected to the outside of the building's heating boiler is an Excelso Water Heater. Burns no fire itself, yet furnishes a constant and practically costless supply of hot water to all tenants.

Excelso Products Corporation

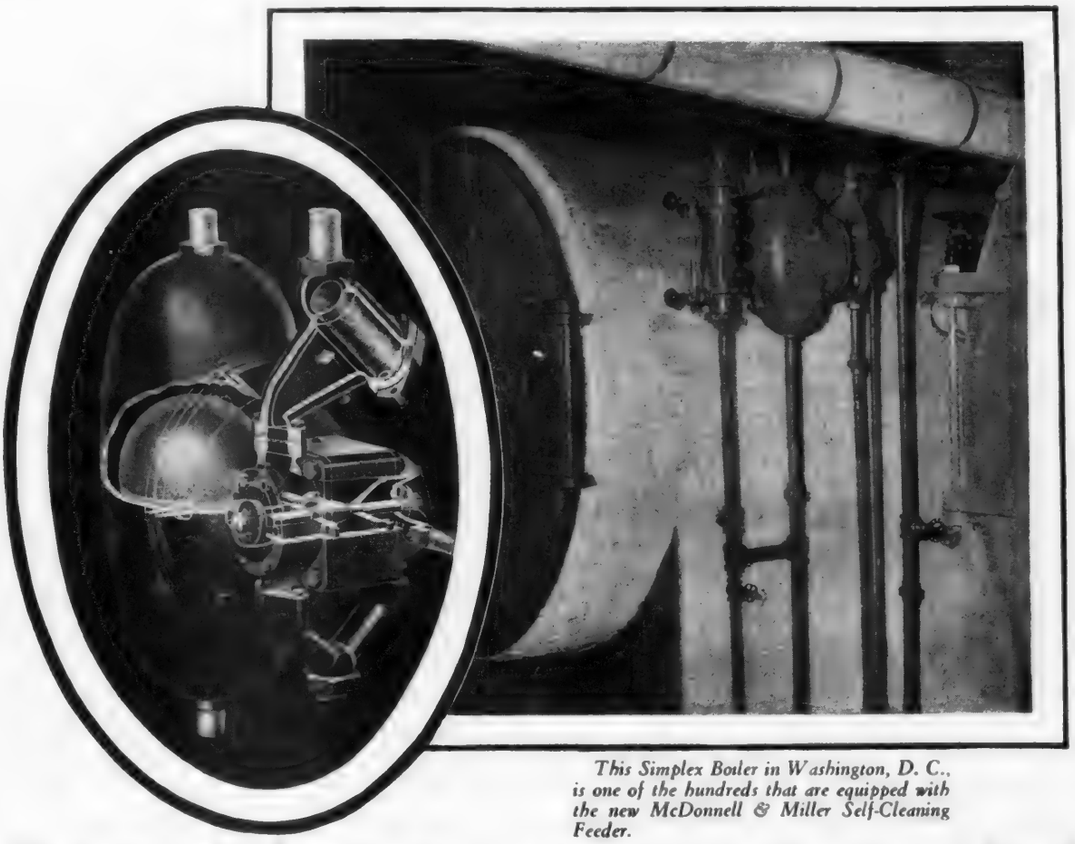
DIVISION OF AMERICAN RADIATOR COMPANY

59 CLYDE AVENUE **BUFFALO, N. Y.**

Nationally Distributed by Leading Wholesalers and Boiler and Radiator Manufacturers

EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters



This Simplex Boiler in Washington, D. C., is one of the hundreds that are equipped with the new McDonnell & Miller Self-Cleaning Feeder.

To forget is human—to protect: *good business*

If it wasn't human to forget, there would be no need for safety valves, block signals and trial balances. But, strangely enough, there are literally thousands of heating boilers that are covered with every kind of safety appliance except the device that offers the most vital protection of all—*the device that keeps the boiler water line where it belongs!*

Go back over the pages of your experience with heating boilers. What has caused more trouble than the boilers that were flooded when someone forgot to turn the feed water *off*? And what has caused more expense than the boiler that cracked or burned out when someone forgot to turn the feed water *on*?

It's an item too important to overlook for another heating season, isn't it? Yes, and it's a function too vital to entrust to any boiler feeder but the *best*.

The new self-cleaning McDonnell & Miller Boiler Feeder is the answer of experience to the growing demand for a feeder that will work right under all conditions —always—anywhere. Its rotary, self-grinding valves are the first to offer uninterrupted service where feed water is hard or rank. Its big capacity makes it equal to any emergency such as failure of current to the condensation pump. Its adjustable water level is the greatest step ever taken in simplifying installation and cutting installation cost. Its unprecedented mechanical refinement is totally out of keeping with its cost which is naturally higher, but very little higher, than that of just an ordinary feeder.

Where shall we mail your copy of the interesting book which contains capacity curves and other data? Tell us on the coupon.

McDONNELL & MILLER, 710 Wrigley Building, Chicago

McDONNELL & MILLER
SELF-CLEANING
Duplex Feeder
"Doing one thing well"

Yes, I want the facts about the self-cleaning feeder.

Company.....

Name.....

Street & Number

City & State

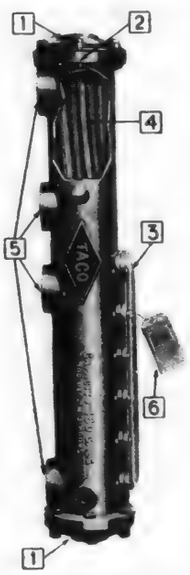
Mail to McDonnell & Miller, 710 Wrigley Bldg., Chicago (H & V-11)

To the Heating Contractors of America

Look into this fast-growing trend toward more effective, lower-cost water heating

Up through the heating industry, each month more insistent, comes the voice of the building owner. Up through the architect, the heating engineer, the general contractor—every influence in the heating field—comes the cry, "Is the water-heating equipment as efficient, as low in operating cost, as modern engineering can make it?"

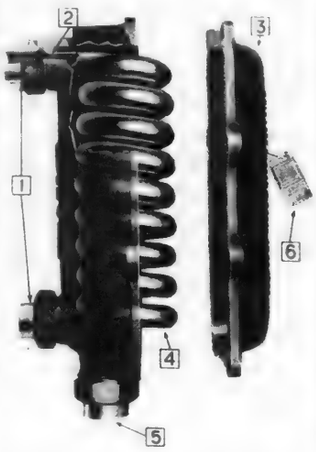
American Heating engineers and contractors long have led the world in heat-engineering accomplishments. Each new installation uncovers new problems, — American heating contractors have solved them well.



But what of the all-important water heating equipment. Scores of contractors have heard the voice of the building owner. They have looked to the vital matter of modern water heating equipment. They have investigated all types and makes. Many have finally standardized on compact, inexpensive FUEL-LESS Taco in connection with steam jobs.

Thus these wide-awake men have assured their customers a never-failing supply of clean hot water at an operating cost that's next to nothing. They have answered the insistent demand. They have assured their jobs, both large and small, against dissatisfaction.

If you are not already putting in Tacos you will be interested in the Taco story. Be sure to get the facts concerning the Super Taco, for large installations. We will gladly give you all the facts and engineering data—show you how to add the finishing touch to well-installed jobs. A post card brings you the whole interesting story.



SUPER TACO

(1) Bronze heads keep water clean
(2) Straight waterway tube connections assure quick heating
(3) Removable cover for easy cleaning
(4) High test copper tubes—can't leak
(5) Convenient tappings for any water line boiler connections
(6) Registered guarantee

DOMESTIC TACO

(1) Bronze Unions cut installation costs
(2) Free-flow all-brass waterway keeps water clean
(3) Removable cover for easy cleaning
(4) 1200-lb. test copper tubing—can't leak
(5) Union for boiler connection
(6) Registered guarantee

TACO HEATERS, INCORPORATED

342 Madison Avenue New York City

Makers of

TACO

Automatic FUEL-LESS Water Heaters

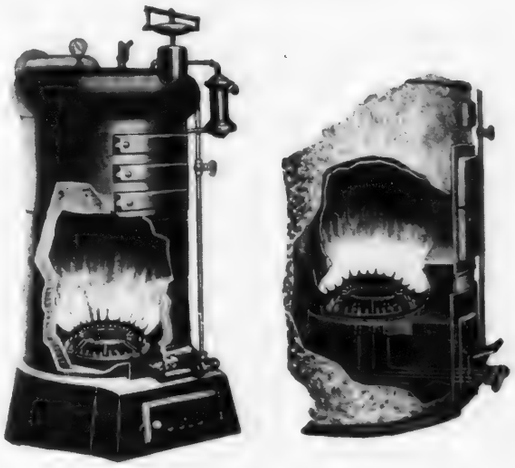
BARBER PATENTED JET GAS BURNERS

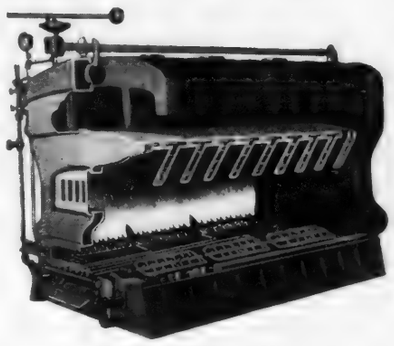
Have Stood the Test of Years

Thousands of installations of Barber Burners are rendering users the utmost satisfactory service in all parts of the country—and under all kinds of gas conditions. This dependable service has established a powerful consumer acceptance for them.

Hundreds of your customers are waiting to have you convert their coal-burning furnaces or boilers into efficient gas heaters with Barber CONVERSION Burners. Equip yourself to do this work, and go after this very profitable business NOW.

Order a Demonstrating Outfit and a stock of Barber Burners to-day. Get our effective Circulars, Broadsides, Window Display Signs, Newspaper Ad Mats, etc. These Sales Helps will create many profitable customers for you. We repeat—send us your order to-day.





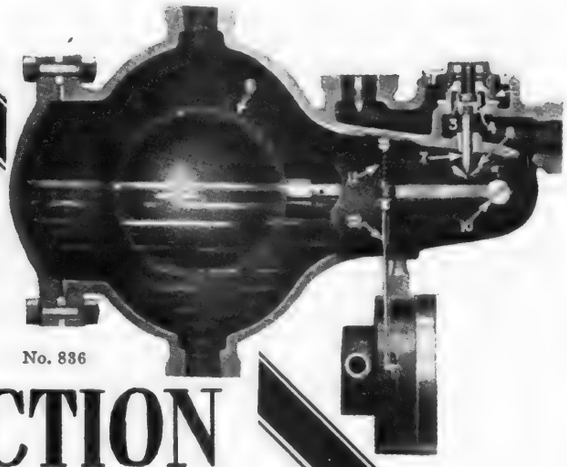
Barber Burners are furnished in a great variety of designs, sizes, and capacities, which render them exceedingly flexible in their application to the exact requirements of any type of heating device. The correct Barber Burner assembly properly installed guarantees the user satisfactory service. Equipped with a Gas Pressure Regulator and Temperature Control, the installation is automatic in its operation.

The CLEVELAND GAS BURNER & APPLIANCE CO.

Burner Specialists

3702-04 Superior Avenue, Cleveland, Ohio

McALEAR
WATER FEEDERS
Give Perfect
BOILER PROTECTION
AGAINST DANGER FROM LOW WATER



No. 836

Standing as a guard. Ever alert. Ready on a moment's notice to protect the boiler against damage from low water, the McALEAR is giving that long sought safety which has made it one of the most preferable of Water Feeders.

No boiler can burn out if it is equipped with a McALEAR Feeder which feeds water direct to the boiler and is equipped with a frictionless valve—the simplest valve ever devised for feeding water to a heating boiler, regardless of size.

And for oil fired boilers, we recommend our Combination Feeder and Low Water Electric Cut-out Switch which not only maintains a constant water line but will throw the electric switch and put the fire out should the water reach the danger point, thereby avoiding damage to the boiler.

Whether the boiler is fired by coal, oil, or gas, there is a McALEAR Feeder which will give the maximum of protection at minimum cost.

Representatives with Stock in Principal Cities

Select the Feeder Suitable for the Service

For Coal Fired Boilers

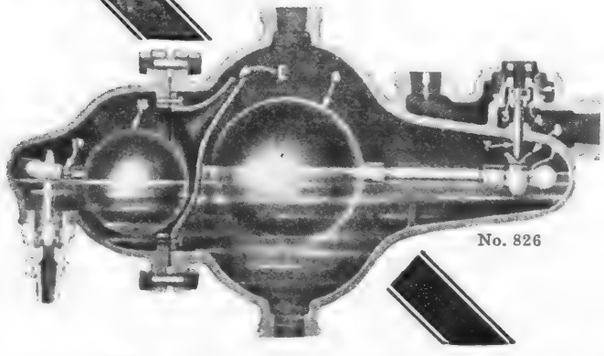
No. 816 Simplex Feeder
826 Duplex Feeder

For Oil Burner Installations

836 Simplex with Low Water Cut-out Switch
846 Duplex with Low Water Cut-out Switch
866 Simplex with Adjustable Pressure and Low Water Cut-out Switch
876 Duplex with Adjustable Pressure and Low Water Cut-out Switch

For Gas Fired Boilers

886 Simplex with Low Water Gas Cut-out
896 Duplex with Low Water Gas Cut-out



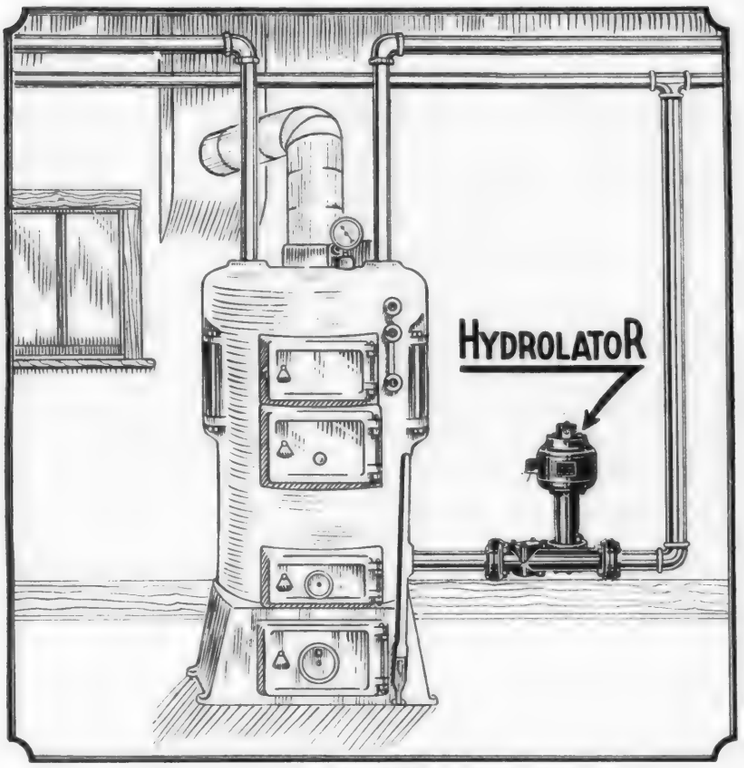
No. 826

Send for Bulletin K-2 today showing installation charts, capacity tables, and describing the No. 2 Valve for boilers up to 225 H.P.

THE McALEAR MFG. CO.

1901-7 South Western Avenue, Chicago, Ill.

The HYDROLATOR Insures Perfect Hot Water Circulation



The HYDROLATOR Corrects All Hot Water Circulation Troubles

New Way to Make More Money And Make Customers Happy

ANYONE who has anything to do with the specification or installation of any kind of a hot water system will appreciate the tremendous value of the HYDROLATOR, in insuring uniform temperatures and reducing heating costs.

The HYDROLATOR is a motor-driven pump introduced into the system (typical installation above), and insures a low temperature differential between supply and return. Users everywhere testify to its value, both from the standpoint of efficiency and reduction in fuel costs.

- **Saves fuel.**
- **Eliminates traps and short circuit.**
- **Forces water thru entire system.**
- **Insures constant supply of hot water.**
- **Increases customer's satisfaction.**
- **Automatic or manual control.**

The HYDROLATOR should by all means be installed on every new hot water job, and will correct circulation troubles on many existing installations. Wherever the HYDROLATOR has been installed, either on industrial systems or in private homes, it has increased the customer's satisfaction with the job. It makes friends for the installer and brings in new business. Use the HYDROLATOR whenever you install a hot water system, or a service water supply system, to get better results. Literally, thousands of installations have proven it to be the best new heating device in years.

Free Engineering Advice

Our Engineering Department is ready to help you with any problem you may have. Write us for free questionnaire, on which you can explain the trouble you are having or give us this information in a letter. We will help you to solve it. There is no charge or obligation.

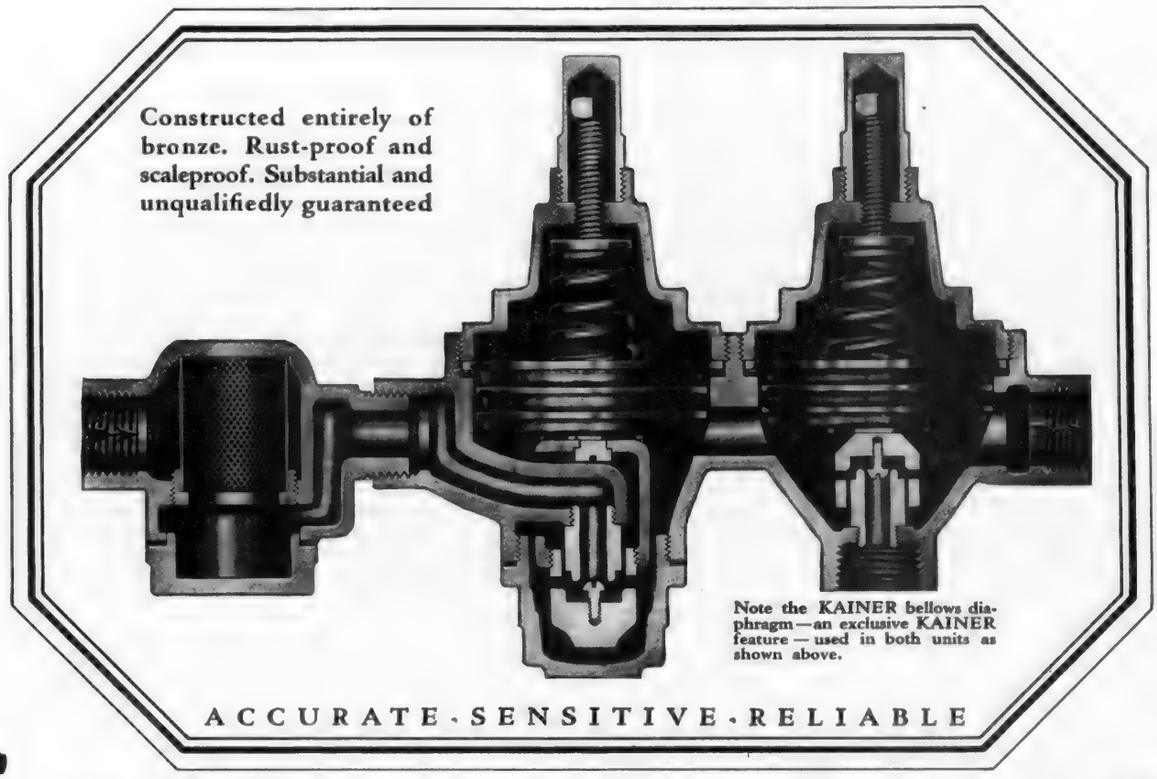
JANETTE MFG. CO. H V-11
556-58 West Monroe St., Chicago, Ill.
Please send me, without any obligation, full details of the HYDROLATOR, and tell me how I can make more money and have more satisfied customers by installing it.

Name .....
Address .....
City ..... State .....

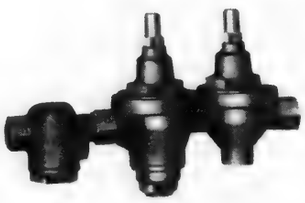
Janette Manufacturing Company
556-558 West Monroe Street
Chicago

Singer Bldg.
149 Broadway
NEW YORK

Real Estate
Trust Bldg.
PHILADELPHIA


Constructed entirely of bronze. Rust-proof and scaleproof. Substantial and unqualifiedly guaranteed
Note the KAINER bellows diaphragm—an exclusive KAINER feature—used in both units as shown above.
ACCURATE · SENSITIVE · RELIABLE

Sound Engineering Principles Characterize the Design and Construction of The KAINER PRESSURE GOVERNOR for Hot Water Heating Systems



The KAINER Governor is conveniently located at approximately boiler height. The filter and reducing units are connected to the water supply line; the relief unit to the return main. Either valve unit may be easily dismounted for inspection.

THE KAINER Governor installed on any hot water heating system, old or new, eliminates the expansion tank with its dangers of freezing and overflowing; insures the user a cleaner system, better circulation with greater heating efficiency.

Rugged filter screen of perforated copper keeps out dirt and scale. The pressure reducing unit permits a full flow of water that quickly fills the system when first installed.

The KAINER Governor is extremely sensitive to any set pressure and thoroughly tested for all working pressures. It is factory adjusted to maintain 10 pounds on the system and to relieve the system at 30 pounds, but any desired change of adjustment or hair-line regulation of pressure is easily and quickly made by means of two simple adjustment screws.

A study of the sectional view will show the advantages and sound sales points that meet with the instant response of prospects everywhere.

Write us for full information.

KAINER & COMPANY
CHICAGO
761-763 Mather Street
Manufacturers of
Plumbing and Heating Specialties

MAKING IT EASIER TO SELL

A home should be built around the heating plant. Without good heating, it is but an empty shell during many months of the year. Thrush System always satisfies.

BUILDERS of homes have been educated to buy advertised products. Your sales problems are greatly simplified when the public knows Thrush System by name.

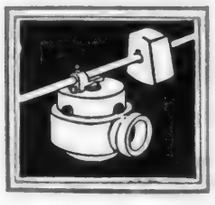
We are telling thousands of builders everywhere that Hot Water Heating is best for their homes and that it is most economically and easily controlled with Thrush System. Cash in on our investment by tying up your business with this big campaign. Push Thrush Equipment for it is the kind of a product you can be proud to sell.

It makes an Automatically Controlled Pressure System from any ordinary gravity hot water job. It will maintain uniform temperatures, reduce fuel consumption, lengthen firing periods and greatly increase the satisfaction which the home owner enjoys. When you install Thrush Equipment, you not only make a nice profit at once, but you make a friend and a booster who will bring you more business.

Nationally Advertised!

In the publications shown above, which are distributed exclusively to individuals planning to build homes and to real estate men and building contractors, Thrush System is being forcefully advertised. A little effort spent on Thrush Equipment in your community will pay big returns Get behind it.

Ask your jobber today



Specify **H. A. THRUSH & COMPANY**
PERU, INDIANA

THRUSH SYSTEM
OF HOT WATER HEATING

H. A. THRUSH & COMPANY. Dept. A. Peru, Indiana
Please send me your catalog and more information about Thrush System.
Also send me the booklet which you are distributing to consumers.

Name _____ ***Address*** _____

My Jobber is _____

Nokol Franchise

More Profitable Than Ever

Today . . . even more than ever before . . . the Nokol franchise opens wider the way of profit opportunity for the dealer.

There are three direct reasons. First—Nokol has the stability which naturally comes with successful pioneering of automatic oil heating for homes. Basic patents, with the backing of the oldest and soundest manufacturer in the industry, give a background of complete confidence. Second—Nokol has a definite protective merchandising policy which enables the dealer to create sales immediately and protects the profits developed. Third—only Nokol offers all accepted models of automatic oil burning equipment!

All Accepted Models

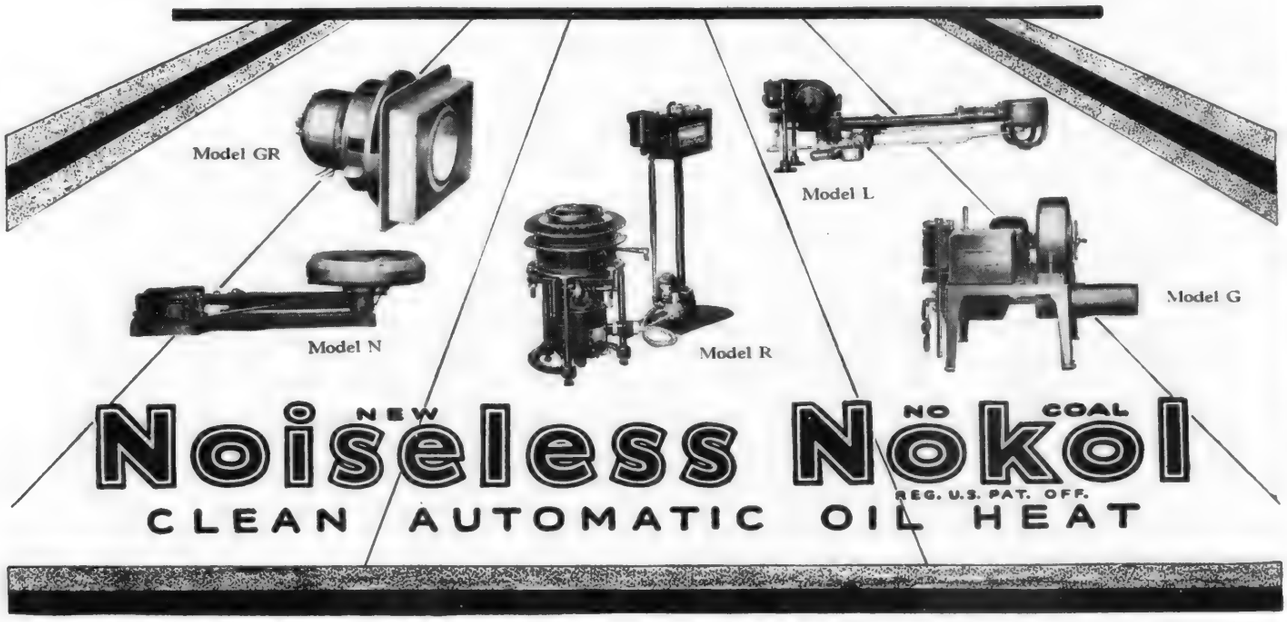
The founders of automatic oil heating equipment for homes offer you stability, protective policy, and all accepted models of automatic oil burning equipment.

Consider what an advantage in selling your men have when they say, "Our recommendations are made according to the exact requirements of your heating plant, for we —and we alone in this community—have *every* accepted model of equipment for the automatic heating of homes with oil. A model for every need—a size for every job —a price for every purse."

Little wonder that the trade finds the Nokol franchise most profitable. The market is absolutely unlimited . . . practically every inquiry is a sale . . . because you have the one *complete* line in the industry . . . Let us give you all the facts . . . today!

AMERICAN NOKOL CORPORATION

4231 Schubert Ave., Chicago, Ill.

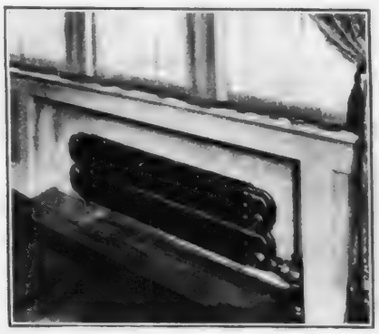


NEW Noiseless NO COAL Nokol

REG. U.S. PAT. OFF.

CLEAN AUTOMATIC OIL HEAT

This shows the recess left under a window for the radiator.



Galvanized metal enclosure and a two-tier, two-section, one pipe radiator in place.

The enclosure with the front added. Note that front must have upper and lower openings and *must never be one large open grille.*

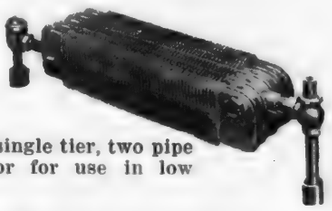
How Do I Know What SIZE ROBRAS 20-20 RADIATOR To Use?

YOU may use whatever size Robras 20-20 Radiator that will give you the required radiation and fit most easily in the space available. The method of construction makes this radiator exceedingly adaptable. If the space available is shallow, long and fairly high, as in the wall, under the window, you would use a two-tier radiator, two-sections deep, as long as necessary, to get the required amount of radiation, as shown in the above illustration.

If the space was broad and low, as under a step or in a staircase, you would use a one-tier radiator as long as the step and as many sections wide as was necessary to give the required amount of heat. This is shown to the right.

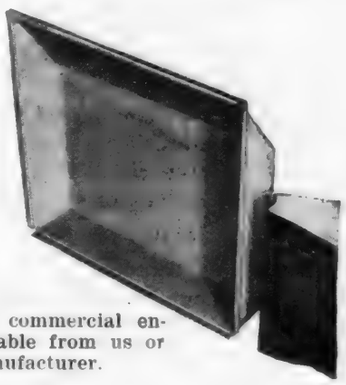
The sections run from eighteen to seventy inches in length and are rated from five to twenty-five square feet of effective radiation. You can easily see how such a wide variety of sizes, set up in the different depths, will easily give any amount of radiation in almost any shaped space.

To get a complete idea of the proper sizes and roughing in dimensions for the different uses of this radiator, you should have our Engineering Data Sheet. A note from you and we will be glad to send it.



Five section, single tier, two pipe steam radiator for use in low places.

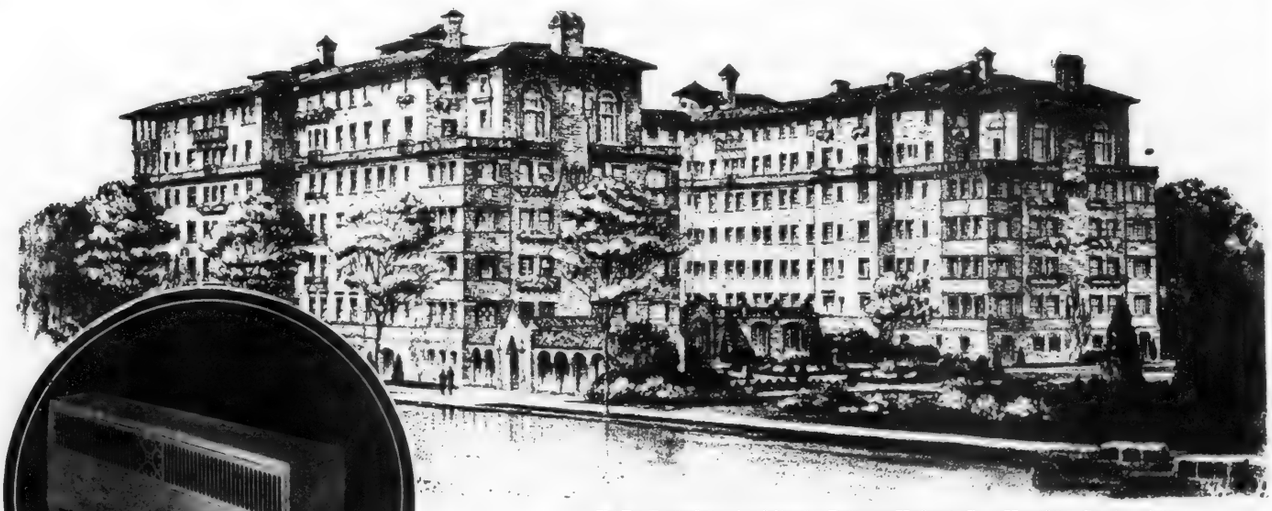
Steps in place over the above radiator. Note grilles in riser of first and third steps.



One type of commercial enclosure available from us or from the manufacturer.

ROME BRASS RADIATOR CORPORATION

ONE EAST FORTY-SECOND STREET :-: :-: NEW YORK CITY



E. D. Parmlee, Architect; Barron-Hubert Co., Heating Contractors

A Complete Radiator Not just a cover

Only a beautiful Cabinet can be seen

but inside of it the Copper Heating Unit provides healthy heat with unusual efficiency

Architects, heating contractors and owners *know* that McQuay Radiators help to rent buildings. For their unobtrusive beauty immediately appeals to tenants. Pictured is the Chatsworth Garden, Larchmont, N. Y., for which McQuay Radiators have been selected.

McQUAY *Cabinet* RADIATOR

Economical heating requires complete circulation of the *warmed air.* With the McQuay a flood of air is poured into rooms with sufficient velocity to create positive circulation. This means quicker and more effective heating. It also prevents soiling of walls and drapes, as the heat goes out into the room—not up. A humidifying pan, inside the cabinet, provides the needed moisture.

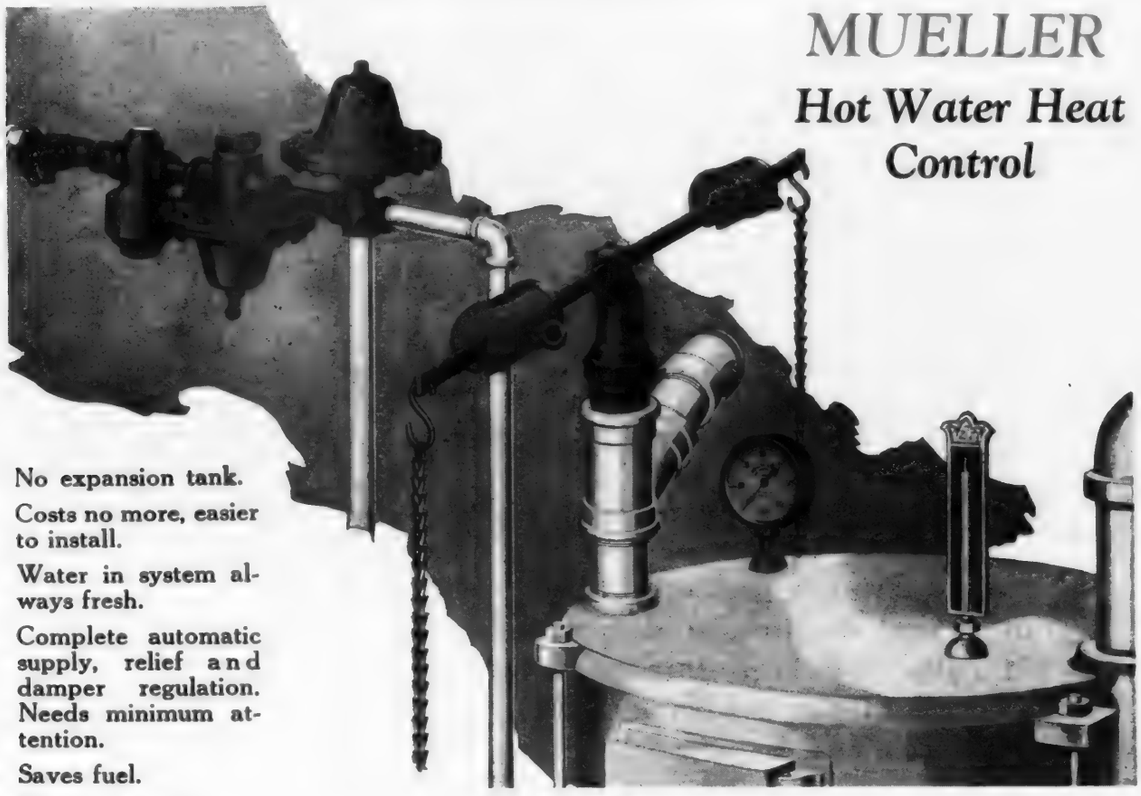
Practical tests prove that with a McQuay the temperature needed for healthy, comfortable heat is *many degrees less* than required by ordinary radiators. Considerable fuel is thus saved.

In factories, offices, stores, etc., McQUAY UNIT HEATERS *get heat where it's needed—quickly and efficiently*

McQUAY RADIATOR CORPORATION General Sales Office: Pure Oil Building, Chicago

Boston: 164 Federal St. New York: 2148 Graybar Bldg. Cleveland: 291 E. 149th St.

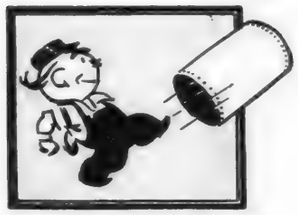
Newark, N. J.: J. F. McLaughlin Co., 738 Broad St.



MUELLER

Hot Water Heat Control

1. No expansion tank.
2. Costs no more, easier to install.
3. Water in system always fresh.
4. Complete automatic supply, relief and damper regulation. Needs minimum attention.
5. Saves fuel.
6. Perfectly safe.
7. Valves positive in action and safest type known.
8. Raised boiling point of water gives more efficient heating.



Kick out the old expansion tank and say goodbye to trouble by giving your customers Mueller Automatic Heat Control.

Builds profits and goodwill

A Mueller Automatic Hot Water Heat Control System on every job, both new and old, is better business for you and for your customer. You make more profit and your customer is satisfied because it costs him no more and gives him 100 per cent automatic heat control.

Write now for booklet and full particulars about our attractive offer.

MUELLER CO. (Established 1857) **Decatur, Illinois**

Branches: New York, Dallas, San Francisco, Los Angeles

Canadian Factory: MUELLER, Limited, Sarnia

MUELLER

Automatic Hot Water Heat Control

now only $385

The new Hardinge Junior is now selling at the sensationally low price of $385 completely installed (tank extra). The advent of this new model has placed dealers fortunate enough to have been carrying the Hardinge line in a very envious position. They are now selling the Hardinge fuel oil burner, famous everywhere for its unrivalled performance and low operating expense, at the same and in some cases an even lower price than dealers are asking for competing burners. ¶The Hardinge line includes a specific model for every heating problem—thus enabling Hardinge dealers to meet any heating requirement from bungalow to skyscraper.

A few territories are still open

Write for full information today

HARDINGE
FUEL OIL HEAT

Hardinge Brothers, Inc.

4149 Ravenswood Ave., Chicago, Ill.

Factory Branch
CHICAGO–MICHIGAN at OHIO

Factory Branch
BOSTON–843 BEACON ST.

KNOW ELECTROL BY THE HOMES IT HEATS

Left: "Hilltop Manor," Suffield, Conn. The home of Mr. George M. Hendee

Below: Residence of Mr. Arthur Moore, Manhassett, L. I.

The Buyer is Entitled to this Complete Oil Heating Service

WHENEVER an Electrol Automatic Oil Burner is sold, the dealer is interested in rendering oil heating service of which the installation of the burner is but a part.

He recognizes that each building presents an individual heating problem... that many variables can and do effect the choice of burner model and the method of installation.

The Electrol dealer will not recommend an Electrol nor proceed with the installation unless he has determined in advance that the burner will give complete satisfaction in the existing heating plant and more comfort, convenience and pleasure than the building owner thought could be derived from any method of heating.

This type of conscientious and complete oil heating service characterizes Electrol dealers everywhere. You can work with them with confidence born of the knowledge that they will respect and protect your professional judgment.

Likewise you can recommend the Electrol Oil Burner with the certainty that it will make good and live up to expectations. Thousands of successful installations all over the country are evidence of Electrol's dependable operation.

An Opportunity for Profit

You can make working arrangements with the Electrol Sales and Service Representative in your locality whereby you can co-operate with him to your mutual benefit and advantage. Without any investment on your part you can make money selling Electrol Oil Burners. The Electrol dealer nearest you will be glad to explain the details of this offer and to show you how you both can profit by working together.

May we send you literature on this finer oil burner and put you in touch with the nearest Electrol dealer? No obligation involved, of course —and a talk with him may open a new source of income for you.

Electrol, Incorporated
177 Dorcas St., St. Louis, U. S. A.

Models for Buildings of all Sizes

Electrol is made in three models for homes and buildings of all types and sizes. The range of the different models is as follows: Model TJ, 200 to 800, Model T, 600 to 3000, and Model TD, 2000 to 8000 square feet of steam radiation including piping and risers or equivalent.

Employs mechanical fuel atomization and positive automatic electric spark ignition. Quiet...All-Electric ...Entirely Automatic. Governed in every phase of its efficient operation by the ingenious and exclusive Electrol Master Control.

A New Source of Income

Let us explain how you can increase your income by working with the Electrol Sales and Service Representative in your city. Write for particulars today.

ELECTROL

The OIL BURNER with *The Master Control*

Listed as Standard by the Underwriters' Laboratories, and bears their label.

Member of the Oil Heating Institute

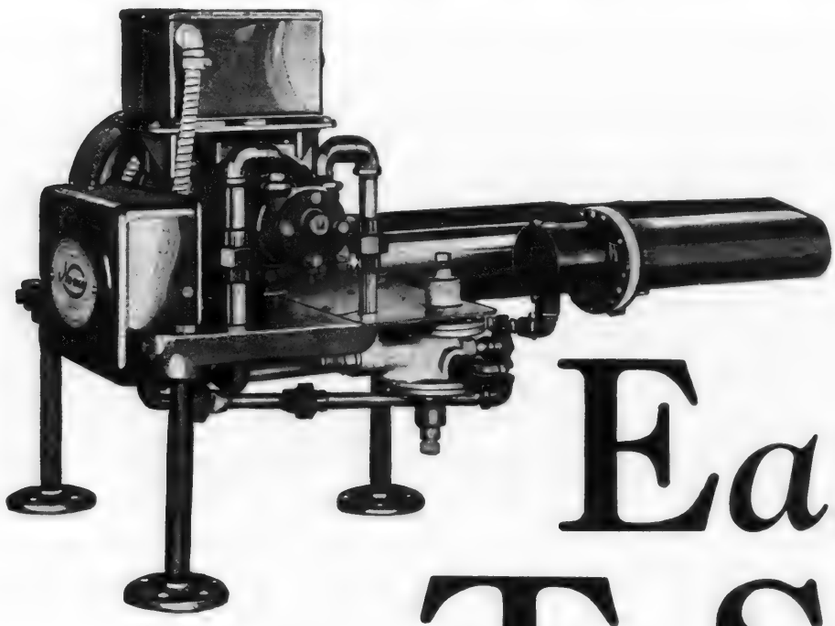
Electrol, Incorporated
177 Dorcas St., St. Louis

Gentlemen: Please send complete details of Electrol Oil Burner . . . . .Who is your nearest dealer . . . . .

Name . . . . . .

Address . . . . . .

City . . . . . State . . . . . .



Easiest To Sell

Those are not our words but the words of dealers from all over the country. And the dealers prove their statements by selling record numbers of Nu-ways. There's time yet, too—until Thanksgiving at least—to make still more sales and more installations.

The 1928 Nu-way has been easiest to sell of all oil burners because demonstrations of its features make sales. Nu-way is a simpler burner. Controls and supply pump are now built into the main unit, making one unit in place of three. Nu-way is more quiet—no flame roar. Nu-way has a constant fire size, unaffected by changes in fuel. Nu-way burns less oil with this improved construction. Nu-way has no extra pump—cutting both the first cost and cost of installation.

If your territory is still open on this easiest selling oil burner, write or wire for prices and terms.

The Nu-way Corporation, Rock Island, Ill.

AUTOMATIC OIL BURNER

Nu-way

FOR HOME HEATING

Automatic Oil Burners

Shaw-Perkins

HIGH CONVECTION Radiators

For Steam and Hot Water Heating Cooling-Drying and Industrial Applications

Compact — Light in Weight

Sanitary

Heat and Cool Quickly

Several Models — Many Sizes

Made in One Piece Jointless Units as long as 14 Feet

Get the Full Story

SEND FOR CATALOG H

Shaw-Perkins Manufacturing Company

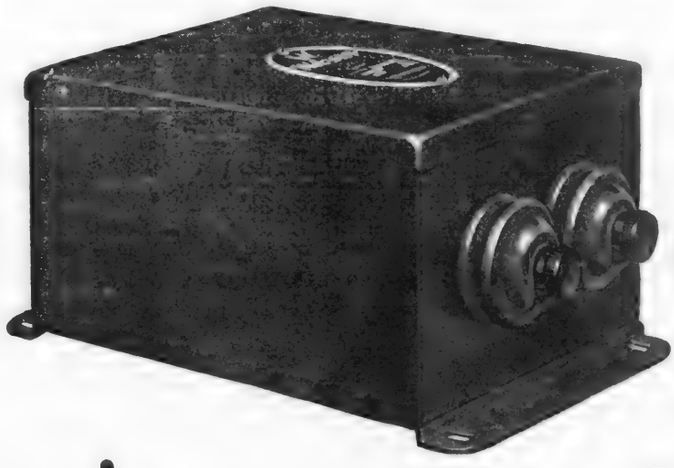
Pittsburgh . Pa.

TESTED and APPROVED

in the service of the Nations finest oil burners

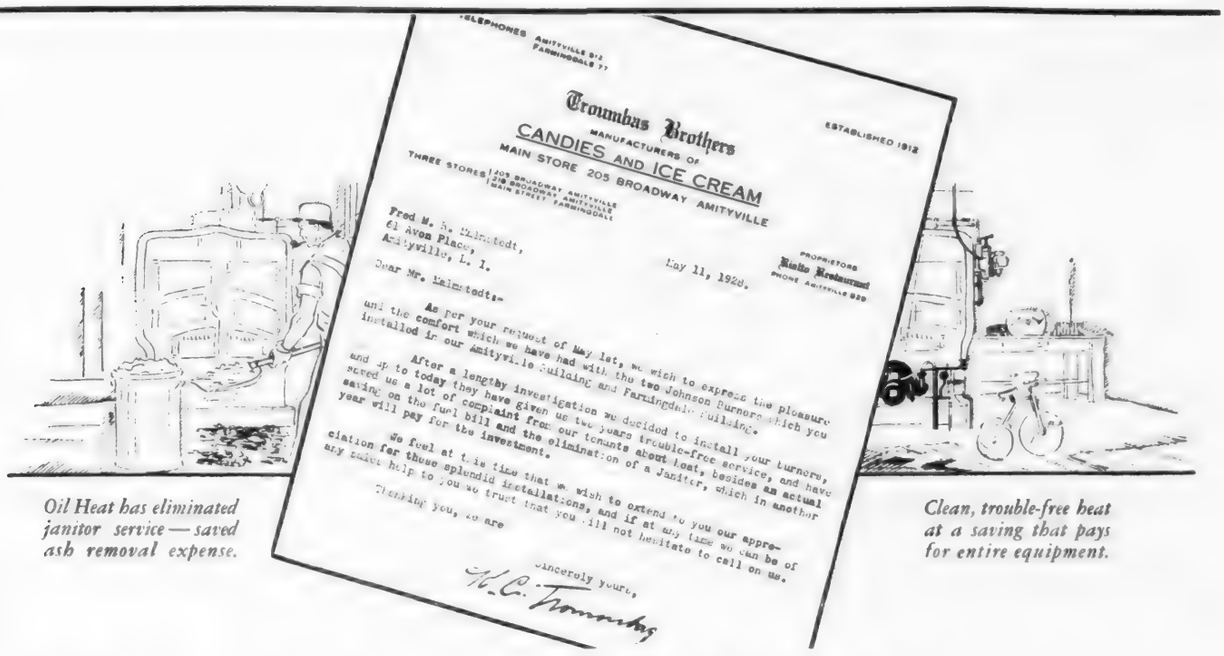
The list of Webster Ignition Transformer users reveals an impressive number of oil burner manufacturers' names . . . They have adopted the Webster unit because it has so thoroughly met their individual requirements . . . . The wisdom of their selection is evidenced by the constant trouble-free Webster service delivered in localities offering a wide variety of ignition problems . . . This same dependable performance so characteristic of all Webster products, is available for use with the oil burner you manufacture . . Interesting details regarding the advantages of its application will be sent upon request by Webster Engineering Laboratories.

WEBSTER ELECTRIC COMPANY, *Racine, Wis.*
"Specialists in Oil Burner Ignition"



Webster W Ignition Transformer

The Webster Ignition Transformer can be furnished with either single or double high tension terminals, for a variety of voltages and frequencies.


TELEPHONES AMITYVILLE 912
FARMINGDALE 77
Trombas Brothers
MANUFACTURERS OF
CANDIES AND ICE CREAM
ESTABLISHED 1912
THREE STORES 205 BROADWAY AMITYVILLE
MAIN STREET FARMINGDALE
MAIN STORE 205 BROADWAY AMITYVILLE
PROPRIETORS
Rialto Restaurant
PHONE Amityville 929
Fred W. A. Helmstadt,
61 Avon Place,
Amityville, L. I.
May 11, 1928.
Dear Mr. Helmstadt:-
As per your request of May 1st, we wish to express the pleasure and the comfort which we have had with the two Johnson Burners which you installed in our Amityville Building and Farmingdale Building.
After a lengthy investigation we decided to install your burners, and up to today they have given us two years trouble-free service, and have saved us a lot of complaint from our tenants about heat, besides an actual saving on the fuel bill and the elimination of a Janitor, which in another year will pay for the investment.
We feel at this time that we wish to extend to you our appreciation for those splendid installations, and if at any time we can be of any other help to you we trust that you will not hesitate to call on us.
Thanking you, we are
Sincerely yours,
W. C. Trombas

Oil Heat has eliminated janitor service — saved ash removal expense.

Clean, trouble-free heat at a saving that pays for entire equipment.

The Johnson Oil Burner pays for itself

In hundreds of cases Johnson Oil Burners have paid for themselves by reducing fuel costs, eliminating janitor service and ash-removal expense. And these savings continue year after year.

Add to this the dependable, trouble-free, efficient performance for which Johnson burners are famous and you will realize that oil heat is the modern, convenient, economical form of heating.

The preference for Johnson burners is shown in the praises of home owners, builders and operators of large buildings, factories and industrial plants from Maine to California.

For more than 23 years Johnson engineers have built to win this preference. Leading architects and heating engineers realize that Johnson oil burners are scientifically correct. They know they can recommend and use them for every heating purpose.

Our Engineering Department, thoroughly experienced in all phases of heating and power problems, will be glad to assist you in any way.

S. T. JOHNSON CO.

Main Office and Factory, 940-950 Arlington Ave., Oakland, Calif.

Factory Branches

SAN FRANCISCO, SACRAMENTO, STOCKTON, PHILADELPHIA

YOU WILL FIND OUR LOCAL REPRESENTATIVE'S ADDRESS IN YOUR TELEPHONE DIRECTORY

JOHNSON OIL BURNERS

Listed as Standard by the Underwriters' Laboratories

SEND FOR THIS NEW BOOK — IT'S FREE

Profits in the oil burner business are limited only by the market for the burner you represent. Our new booklet, "TODAY'S OPPORTUNITY" tells how you can build a profitable and substantial business. It shows you why the Johnson Franchise offers greater dealer profits.

Just write "Today's Opportunity," please — on your letter head or business card and your copy will be sent without delay.

IS *the* OIL BURNER *business* GOOD?

For three months KLEEN-HEET *dealers and branches have been busting all past sales-records*

Just a bit of news for anyone who is interested in the oil burner business. Enthusiastic as we are about the new small-home "CHALLENGER" KLEEN-HEET and the great "SERIES 800"—not even we figured these sales-records *could* go as high *as they are going.* The answer must be just this: *burners that do a really fine job, plus modern, common sense advertising and sales methods.* More than ever we know that the future of this industry is greater than our biggest optimists have imagined.

WINSLOW BOILER & ENGINEERING CO.

844 Rush Street, Chicago

New York Showroom: 11 West 42nd Street, New York City

IN-AIRID

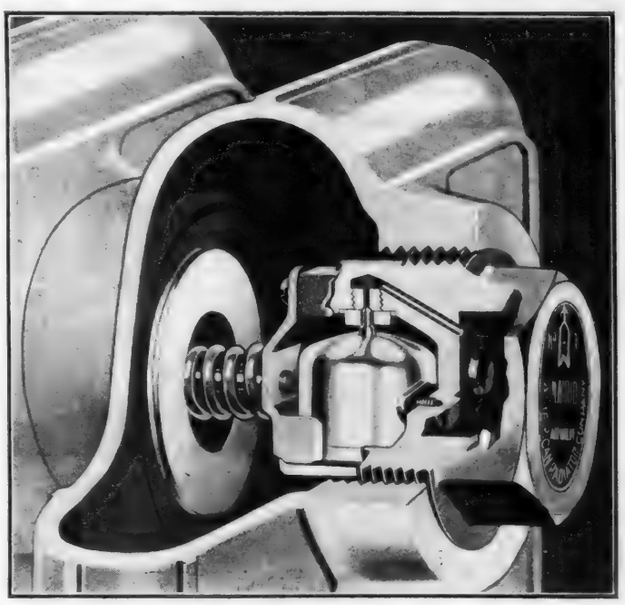
The Invisible AIR VALVE

The talk of the Industry

THE new IN-AIRID air valve recently introduced has met with widespread favor among the heating trade. Everywhere the new valve is proclaimed as a great step forward for it not only effects more complete radiator venting but makes possible the extremely desirable feature of having the valve entirely concealed within the radiator.

As you know, there is a tendency for steam to short circuit through the top nipple connections of new water type radiation, and close the air valve before all the air has been driven from the central part of the radiator. This trapped air greatly reduces the heat output.

The IN-AIRID prevents short circuiting, for, as the illustration shows, it has a special design with a baffle disc which completely blocks off the opening to the last section thus forcing the steam to travel down the next to the last section and up the last before it can come in contact with the valve float and close it.



IN-AIRID No. 2 VACUUM VALVE

The IN-AIRID No. 1 is for one pipe steam systems. The IN-AIRID No. 2 vacuum valve is for "below atmosphere" jobs. The No. 2 has all the venting qualities of the No. 1, plus the vacuum seal with hand lapped monel disc and seat.

Here are some of the advantages the new IN-AIRID presents:

Prevents short circuiting—assures complete venting of all the air—makes all sections hot.

Easily installed—Inexpensive

Entirely invisible, thereby improving the appearance of the radiator.

Dry venting—IN-AIRID is in the driest part of the radiator, yet, should water reach it the float closes instantly.

Cannot "water log"—no siphon necessary, because there is no shell to hold water.

Cannot be stolen or turned upside down—preventing operation.

Order a trial dozen IN-AIRIDS today. You will want to install them on all of your one pipe steam jobs after you have seen one operate.

AIRID AIR VALVE No. 500

AIRID No. 500

IN-AIRIDS can only be installed on new water type radiation, but for old steam type that has nipple connections only at the bottom, the famous Airid No. 500 is the best valve to sell.

In your locality there are many steam type radiators equipped with old, worn-out, inefficient air valves. These offer a big market for the No. 500. Last season an aggressive dealer sold six hundred Airids over his counter at a clear profit of more than three hundred dollars.

Airid replacement business can be a source of big profit for you this Winter.

Advertisements now appearing in the leading magazines will tell millions of readers that Airids make radiators hot. Take advantage of this advertising by putting a display of Airids in your window.

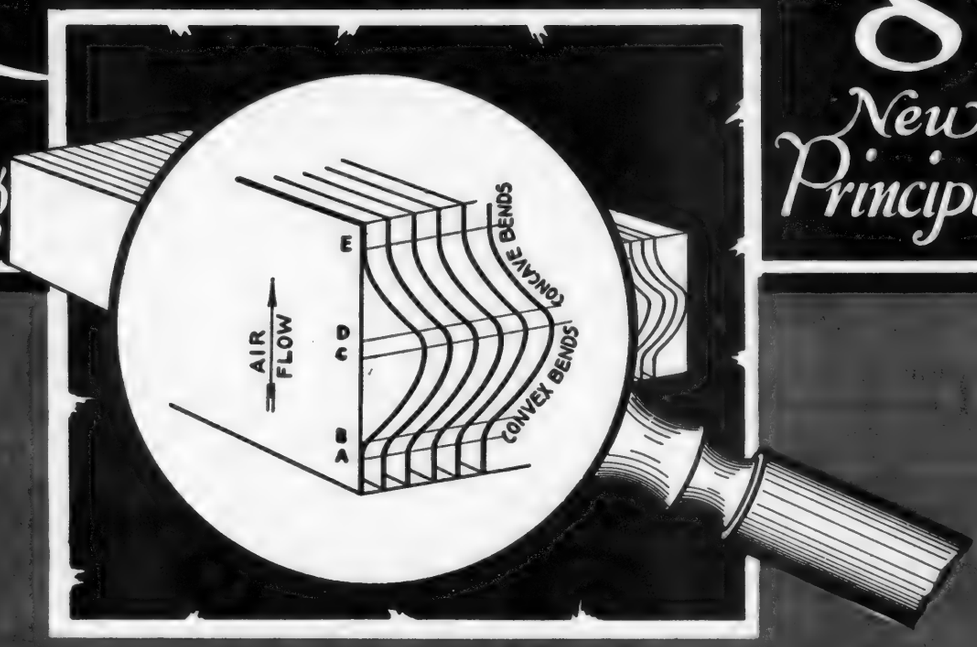
Vac-Airid No. 510 for "below atmosphere" jobs—allows the air to escape but prevents its return into the system.

AMERICAN RADIATOR COMPANY

40 West 40th Street Accessories Division IAV-711 New York, N. Y.

Announcing

A Startling New Principle



"Controlled" Air Flow

The energy used up in accelerating the air flow through the Midwest Sinuous filter cell is not appreciably dissipated as in the case of the multi-baffle, uncontrolled air flow types of filters, but is partially regained by application of the Venturic principle and transmitted unimpaired to the outer air stream.

In the section A-B the air is bent and accelerated, causing dust to impinge as shown. Between B and C the air flow is retarded and kinetic energy changed into pressure. This pressure is utilized for a second acceleration C-D. Between the points A to D inclusive, the combined action of retardation, bending and acceleration causes all dust particles to be thrown out of the air stream by their own inertia. The cycle is completed at D-E where the air flow is again retarded and kinetic energy regained as pressure.

THE "SINUOUS" IN THE "VERTICAL"

Throughout the scientifically designed laminae pictured above, air is controlled and cleaned in one efficient operation. Successive baffles and duplicate cleaning operations are done away with, as are all eddies and disturbances which tend to increase resistance.

See It Demonstrated

MIDWEST AIR FILTERS

INCORPORATED

BRADFORD, PENNSYLVANIA

Offices in Principal Cities

The "Sinuous"

High Velocity Filter Medium

... The Same Efficiency
... The Same Resistance

— But DOUBLE the ..... capacity

A Big Step Forward

To take any air filter of recognized standing in the competitive field—after a decade of widespread experimentation—and double capacity without increasing resistance or decreasing efficiency, has been a goal to be sought but scarcely to be accomplished. Yet this is precisely what has been done in the case of the Midwest Sinuous Filter medium.

Comparison of this filter with others in the fundamentals of efficiency, resistance, capacity and cost will immediately establish the unique position it holds in its field.

Efficiency is 96 to 98% guaranteed. Resistance is .25" W.G. Capacity is 3500 c.f.m. per cell, or more than double that of conventional types. *This means that a filter of any given size equipped with the Sinuous Filter medium will do twice the amount of work.* The saving in space is double. Thus there is opened up a broader field of air filter application, with clean air available at lower cost to many additional classes of prospects.

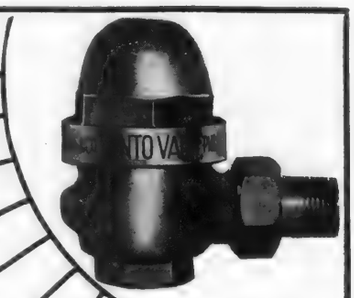
THE "SINUOUS" IN THE "HORIZONTAL"

At The Power Shows

MIDWEST AIR FILTERS
INCORPORATED
BRADFORD PENNSYLVANIA
Offices in Principal Cities

Containing 2000 offices, Salmon Tower Building is one of the biggest and finest buildings in New York.

HAINES TRAPS were installed because they will function perfectly year after year without need of attention or repair.



VENTO

York & Sawyer
Architects

Clyde R. Place
Engineer

SALMON TOWER BUILDING, 11 W. 42nd ST., NEW YORK
W. G. Cornell Co., Heating Contractors

WILLIAM S. HAINES & COMPANY

MANUFACTURERS OF VACUUM HEATING EQUIPMENT

12TH AND BUTTONWOOD STS. PHILADELPHIA, PA.

Announcing–
ILLINOIS
ZONE HEAT CONTROL

The added refinement of zone heat control to ILLINOIS *Heating Systems* through the use of Automatic Master Control Valves on branch mains under the Hornung patents.

With ILLINOIS *Zone Heat Control* the following results are positively effected:

Hornung Master Control Valve

1. Heat on or off of any section of building by automatic thermostatic control.
2. Oil Burner, Stoker or Draft Dampers operated automatically in accord with steam demand.
3. Vacuum Pump automatically controlled to start, maintain vacuum in returns at fixed ratio to pressure in supply mains, or stop, according to operating demands.

It will be to your advantage to learn of this advanced development in heating

CORRESPONDENCE INVITED

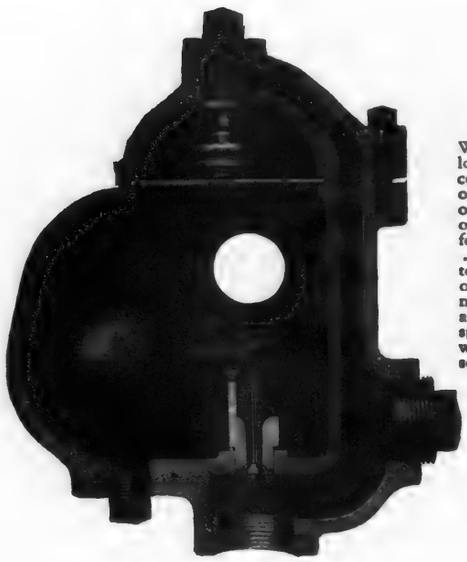
Visit our Booth at the NEW YORK POWER SHOW

REPRESENTATIVES IN 40 CITIES OF U.S.A.

ILLINOIS ENGINEERING COMPANY

ROBT. L. GIFFORD President INCORPORATED 1900

CHICAGO



Webster 026 Drip Trap—for low-pressure service. Shipped complete with one inlet and one outlet plugged. Other inlet and outlet provided with ¼" x 1" or ¾" x 1" bushing when desired for installation in 1" or ¾" pipe ....Cap screws and copper asbestos gasket permit easy removal of cover. Interior elements of non-corrosive metals removable as units . . . Outward opening spherical seated valve.. A socket wrench is all that is needed for servicing.

Webster Drip Trap

—*a Proven Success*

Improvement of Webster Systems is a continuous process. Not "yearly models" or occasional "sensations" but steady progress. Improvements in the "Webster Line" are continuous—new items are developed whenever needed to meet new conditions.

The Webster Drip Trap is a striking example of the working of this policy. It was developed only two years ago to provide a heavy duty trap that was lighter . . . more compact . . . easier to install right in the line without other support . . . yet capable of handling a large volume of condensation and embodying the proven features of thermostatic air discharge with the widely-known Webster Return Trap element.

The Webster Drip Trap has been received with enthusiasm by heating engineers and the heating trade. In the brief period of two years, more than 15,000 have been sold and installed in Webster Systems of Steam Heating.

Operating Engineers of existing Webster System installations are incorporating this improvement when making changes or extensions. Others are using the 026 Drip Trap together with Webster Service in order to improve or modernize their systems.

Send for the bulletin describing this item of the "Webster Line".

- since 1888

Webster

Systems of Steam Heating

WARREN WEBSTER & COMPANY

Pioneers of the Vacuum System of Steam Heating

Camden, New Jersey — 52 U. S. Branch Offices

MORE THAN 46,000 INSTALLATIONS IN AMERICA'S FINER BUILDINGS

WARREN WEBSTER & COMPANY, Camden, New Jersey

Please send Bulletin 712 giving facts regarding Webster Drip Traps, also Bulletin 709 describing the Webster Dirt Pocket to

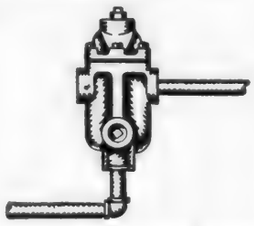
Name..... Title.....

Address.....

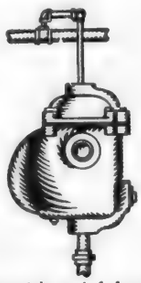
HVM-11-28

Some Ways of Installing Webster Drip Traps

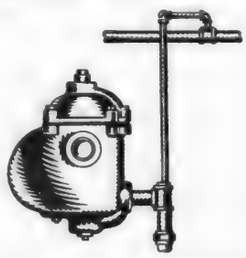
Supply to left hand inlet (upper). Return to side outlet.



Supply to right hand inlet. Return to bottom outlet.



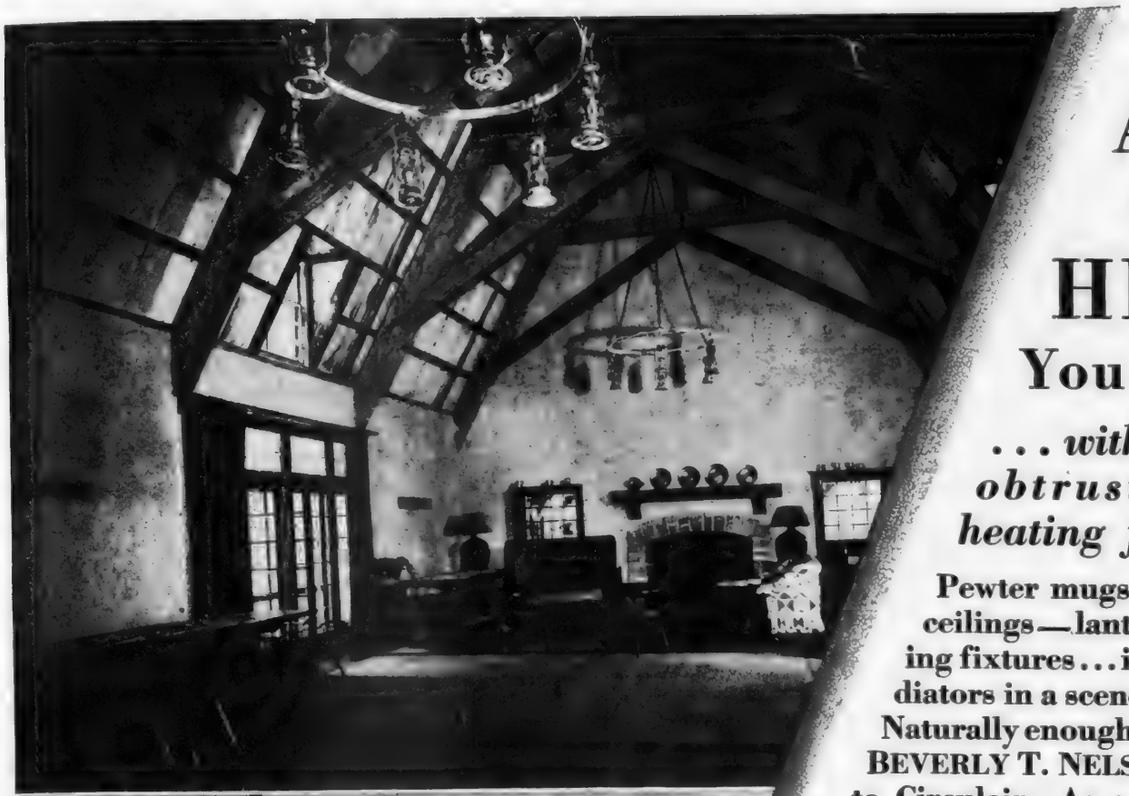
Supply to right or left hand inlet. Condensation removed through bottom outlet to no-pressure wet return at floor. Air vented through top to overhead dry return.



Supply to right or left hand inlet. Condensation and air removed through side outlet, water of condensation flowing to a no-pressure wet return at floor and the air vented to dry return main overhead.

The Webster Dirt Pocket

Protects the mechanism of the trap from dirt, scale and foreign matter. Note simplicity as compared with the home-made dirt pocket of pipe and fittings. With the new Webster 026 Dirt Pocket you eliminate six fittings and save the cost of cutting four threads — besides providing better dirt protection. Fully described in Bulletin 709 which will be sent on request.



Three scenes in the lounge of the exclusive new Deer Creek Riding Club, St. Louis County, Mo. Beverly T. Nelson, Esq., Architect.

ALL the HEAT You Want

. . . without the obtrusion of heating fixtures!

Pewter mugs—beamed ceilings—lantern lighting fixtures . . . imagine radiators in a scene like this! Naturally enough, Architect BEVERLY T. NELSON turned to Circulair. As a result, *six high-stack, concealed Circulair Heat Units are adequately heating a space that would otherwise have required hundreds of feet of cast-iron radiation!*

For EVERY *Heating Need!*

Not alone in such exclusive, period projects as the Deer Creek Club is Circulair saving space, enhancing architectural treatments and bringing an entirely new conception of heating efficiency. Hundreds of modern homes and apartments—and even offices—now embody these revolutionary, completely controllable, Circulair Heaters.

Circulair was designed and developed by Willis H. Carrier, dean of scientific air conditioning. It will pay you to know all its advantages.

Write today for the illustrated catalog (made to fit your files). It contains full descriptions, data and details concerning Circulair Heat Units, together with suggestions for their convenient installation. Use the coupon. Circulair Heat, Incorporated, 218 Central Ave., Louisville, Ky.

Circulair HEAT

CIRCULAIR HEAT, Incorporated, 218 Central Avenue, Louisville, Ky.

Send, without obligating me, catalog and complete data on Circulair Heat Units.

Name .....

Address .....

City ..... *State* .....

V. W. Hunter Tells Why

The Grant Building, Pittsburgh

Selected the Dunham Differential Vacuum Heating System

"I am pleased to advise you relative to our reasons for selecting the Dunham Differential System for the Grant Building in preference to other types of heating systems.

"We made a very thorough investigation, and are convinced that it will effect economies and temperature control superior to any other system with which we are familiar. It is necessary from time to time to make some changes in the sizes and location of radiators in a building of this type, and also add additional radiation. This can be done with a Dunham Differential System without unbalancing it, and eliminates the high engineering costs, which would be necessary to properly balance an orifice type system. The higher vacuum produces rapid circulation, and permits steam to be turned on later in the morning and still bring the building up to the desired temperature.

"In operating under higher vacuum, steam temperatures are reduced, which effects uniform inside temperature to satisfy the demand of the outside temperature. We found that the higher vacuum is very easily maintained by using your packless inlet valves.

"Therefore, for the additional cost of your Differential equipment, we are convinced that we have selected the best."

Complete information concerning this System of Heating upon request.

C. A. DUNHAM CO.

DUNHAM BUILDING

450 *East Ohio Street, Chicago*

Over eighty branch and local sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

GRANT BUILDING
INCORPORATED

BUILDING BEING ERECTED AT
GRANT STREET
FOURTH AND THIRD AVENUES

TEMPORARY OFFICES
1220 FARMERS BANK BUILDING
PITTSBURGH, PA.

September 8, 1928

C. A. DUNHAM COMPANY
C. W. Wheeler, Manager,
Pittsburgh Branch Sales Office
May Building, Pittsburgh.

Dear Sir:

I am pleased to advise you relative to our reasons for selecting the Dunham Differential System for the Grant Building in preference to other types of heating systems.

We made a very thorough investigation, and are convinced that it will effect economies and temperature control superior to any other system with which we are familiar. It is necessary from time to time to make some changes in the sizes and location of radiators in a building of this type, and also add additional radiation. This can be done with a Dunham Differential System without unbalancing it, and eliminates the high engineering costs, which would be necessary to properly balance an orifice type system. The higher vacuum produces rapid circulation, and permits steam to be turned on later in the morning and still bring the building up to the desired temperature.

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Therefore, for the additional cost of your Differential equipment, we are convinced that we have selected the best.

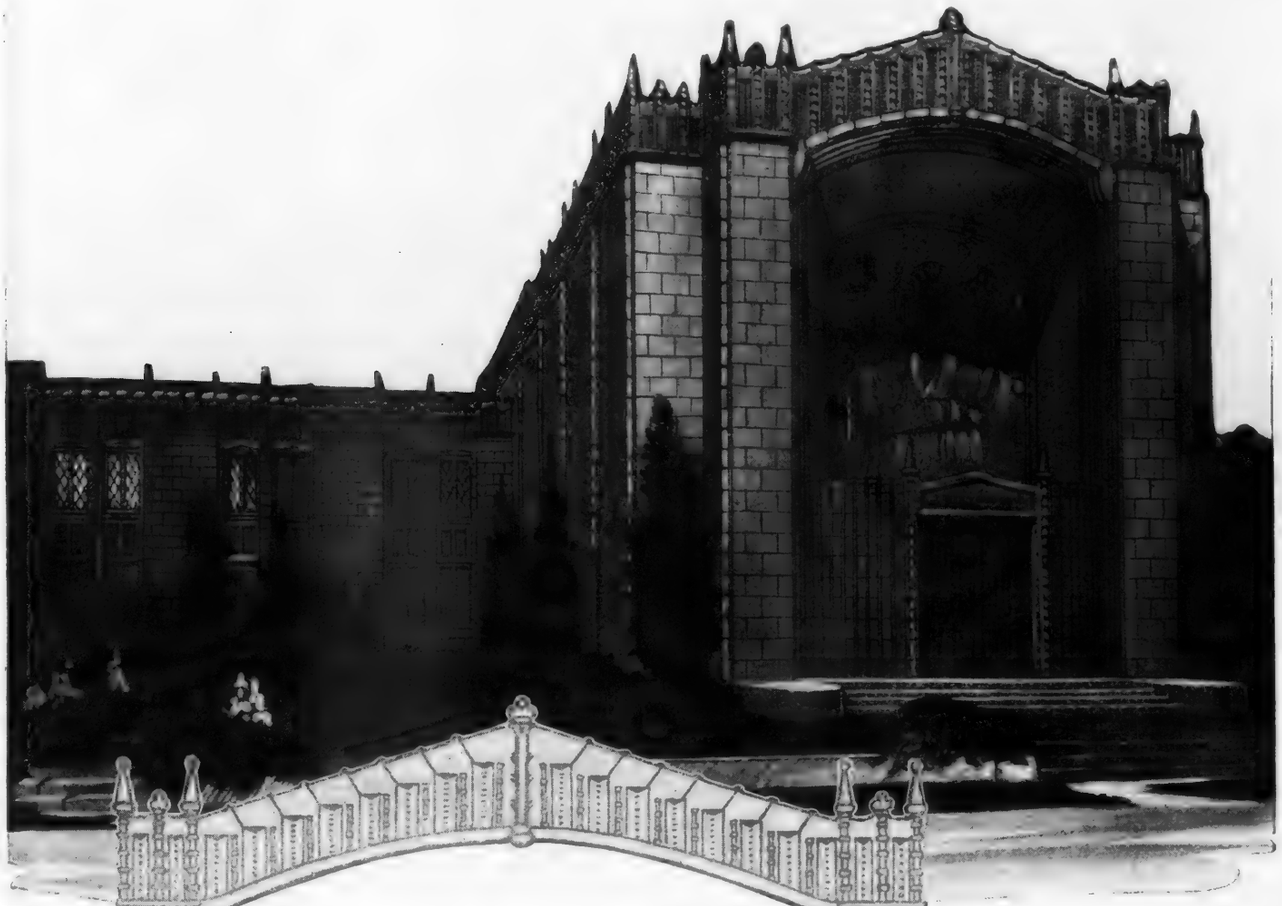
Yours very truly,

GRANT BUILDING, INCORPORATED.

V. W. Hunter, Superintendent.

U. S. Patent No. 1644114. Additional patents in United States, Canada and foreign countries now pending.

Architect, H. Hornbostel. Assoc. Architects, Eric Fisher Wood & Co. Consulting Engineer, Thos. Payne. Heating Contractors, McGinness, Smith & McGinness. Thompson-Starrett Company, General Contractors



UNIVERSITY WARD CHAPEL, SALT LAKE CITY . . . . POPE & BURTON, ARCHITECTS . . . . EQUIPPED WITH JOHNSON HEAT CONTROL.

There are specific reasons for the high regard in which the Johnson System of Heat Control is held by architects and engineers generally. Johnson Heat Control fulfills a need in an efficient manner: wanton heat waste and enormous fuel costs are prevented . . . . a 25 to 40 per cent economy is substituted. Overheating, its damages and discomforts, are overcome. Johnson permanency and accuracy, due to its all-metal construction, appeal to the profession. Architects and engineers, as well as custom, set certain building standards and requirements. All are conformed with and successfully met by Johnson Heat Control. Therefore, the Johnson System Of Heat Control is accepted by architects and engineers in their respective fields . . . . . for every type of building.

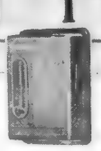
JOHNSON SERVICE COMPANY
MILWAUKEE . . . . . WISCONSIN

BRANCHES IN ALL PRINCIPAL CITIES

AUTOMATIC TEMPERATURE REGULATION SINCE 1885

The All-Metal System. The Dual (Night and Day) Control. The Perfect Intermediate, Graduated Regulation.

JOHNSON · HEAT · CONTROL



TRANE SELECTED — *for* Beautiful New Mayo Clinic

ROCHESTER — MINNESOTA

Climbing sixteen stories into the air and topped by an enormous tower this beautiful structure is an outstanding building of its type.

ARCHITECTS:
Ellerbe & Company, St. Paul

ENGINEER:
N. D. Adams, St. Paul

CONTRACTOR:
Maass & McAndrew, Rochester

ENGINEERS responsible for the new Mayo Clinic Building, recently erected for the famous Rochester Surgeons—Mayo Brothers — chose with care a heating system that would embody the inherent requirements of the modern clinical building.

A complete Trane Heating System using 698 Bellows Traps and 440 Concealed Heaters was selected. The trap selection was made on the basis of performance of other Trane Traps in Mayo owned buildings. In 1926, the old Mayo Clinic Hospital was outfitted with 260 Bellows radiator traps. Since that time dozens of traps have been installed on replacement jobs throughout various buildings. And now comes this crowning achievement of Mayo Building for which Trane Traps were selected because of known reliability.

Trane Bellows Trap. Phantom View of Trane Concealed Heater.

Trane Concealed Heaters replace bulky radiators entirely on this installation. Concealed between the walls, out of the way and out of sight they provide adequate heat always under instant control — a prime requisite in a building of this type. Special duct work is so arranged that either room air may be recirculated over the heating unit or fresh air may be drawn in from the outside. In effect, each room throughout this imposing edifice has its own ventilating system—instantly controlled without regard to the rest of the building.

The confidence imposed in the Trane Heating Equipment by the Mechanical engineer and owners was not superficial but based on the owners' experience as a user and the engineer's knowledge of the mechanical perfection and positive capacities that are insisted on in the Trane Plant for all products. Write for additional information on the complete Trane line of heating equipment.

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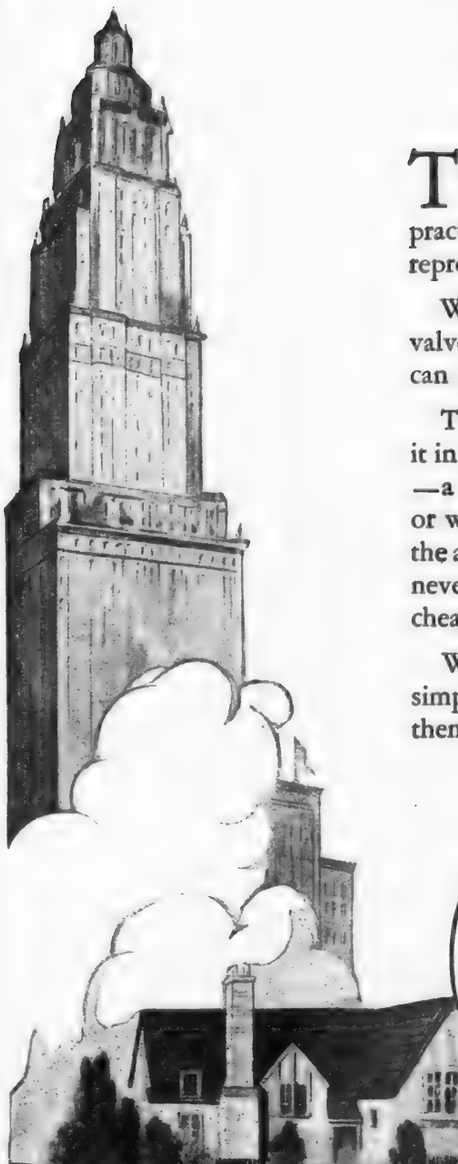

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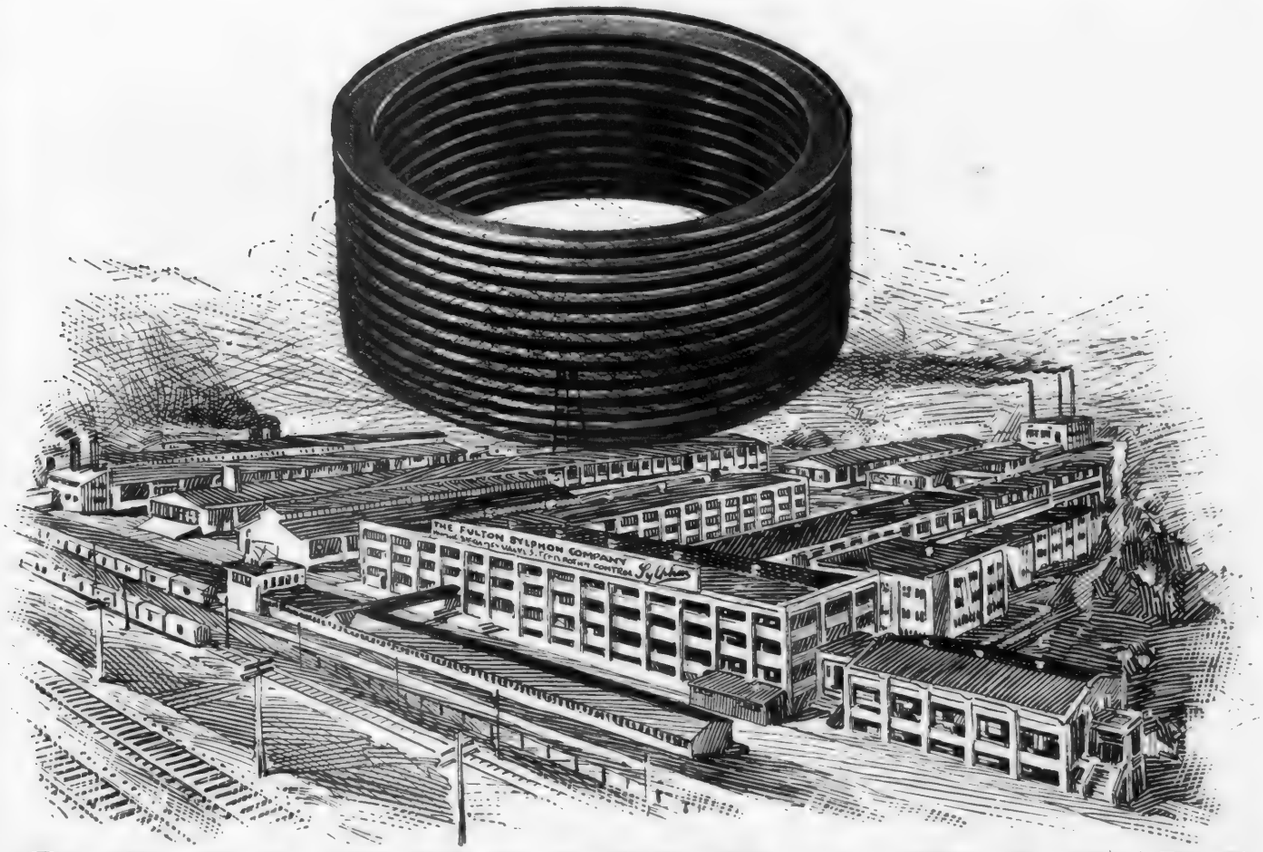

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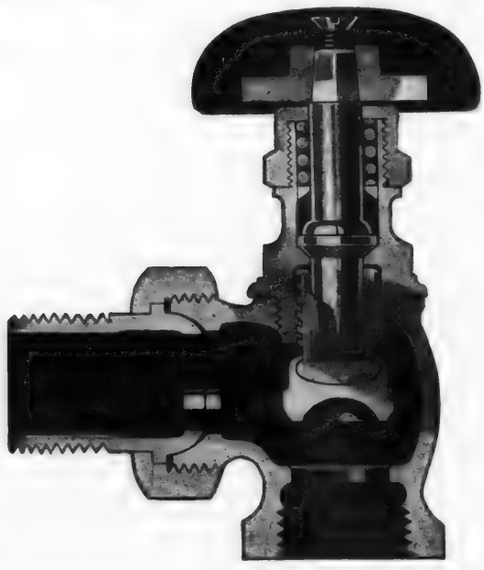

Oval Wheel
or
Lock Shield

Fig. 137

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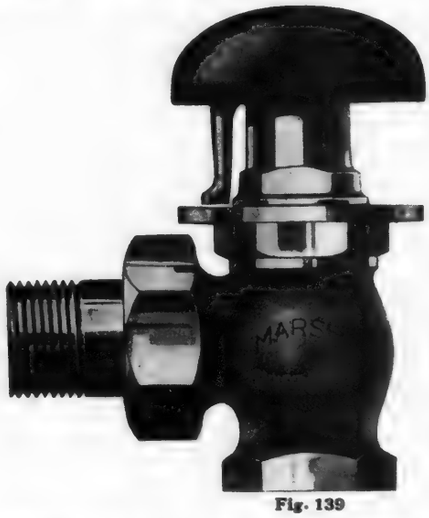

Fig. 139

Oval Wheel,
Lever Handle
or
Lock Shield

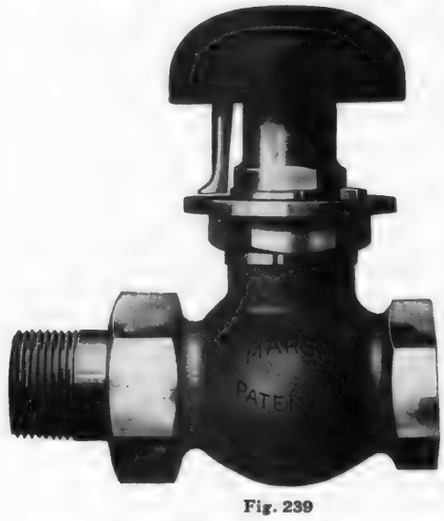

Fig. 239

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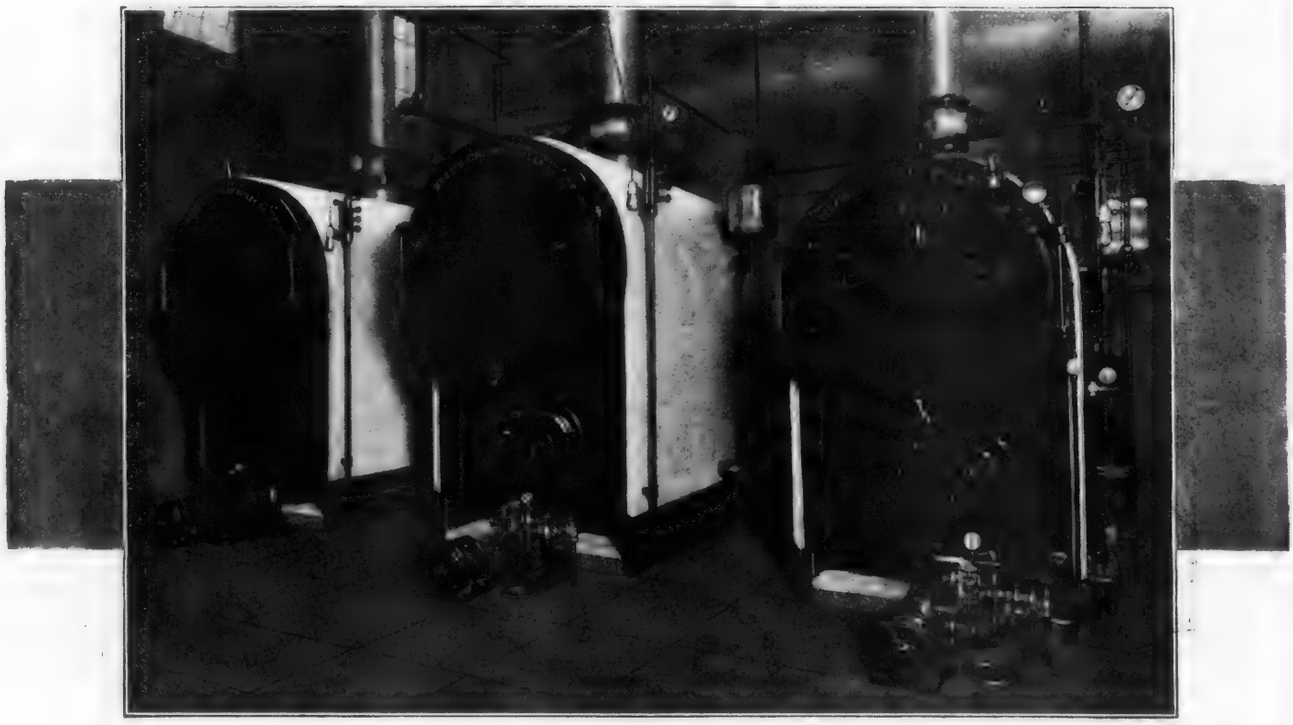

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The Heating & Ventilating Magazine

Volume XXV

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Number 11

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Editorial Policies

MORE than once during the past two years solicitous readers gently but firmly have impressed us with their belief that our editorial policy was becoming too "oily." Judging from the contents of the present issue, with its reports of recent activities in the gas industry, we now are open to the charge that we are becoming too "gassy."

Well, we admit the soft impeachment. The fact is, gentlemen, that oil and gas heat are here to stay. Consequently, we should fail in our obligation if we ignored or minimized the significance of what is happening in these two fields. We are witnessing today a profound change in the elements composing the heating industry. We are seeing the development, on an impressive scale, of groups of oil-heating men and gas-heating men and, gradually but surely, they are learning "what it is all about." There is the same need for the heating contractor to learn what "it is all about" with regard to oil and gas heating. Furthermore, the new elements entering the field are showing a vision and a spirit of enterprise which, as everyone knows, the heating industry sorely needs.

It is not too much to say that the heating industry, as we know it, must expand its scope to absorb these new elements, or face the prospect of being blanketed by the more aggressive and wide-awake elements entering the field.

A. V. Almquist

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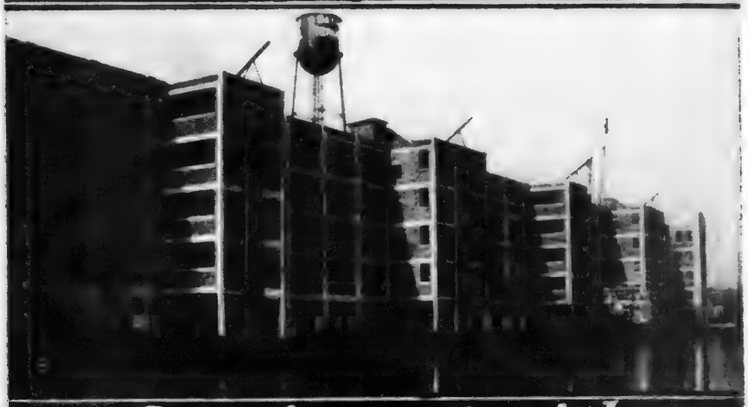

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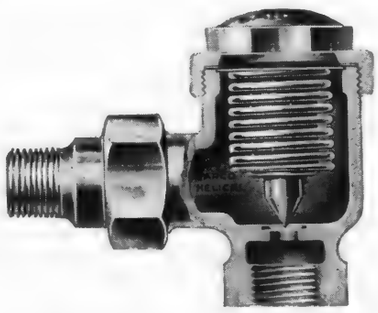

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The Heating & Ventilating Magazine

Volume XXV NOVEMBER—1928 Number 11

Burning GAS in COAL BOILERS

Reliable and Efficient Conversion Equipment Has Been Developed by Manufacturers in Spite of Difficulties. Descriptions of the Better Known Units Are Presented in These Articles

By Clifford Strock

Assistant Editor, The Heating and Ventilating Magazine

CONVERSION of coal-fired boilers to the use of gas has been, for some years, a live subject among gas companies, heating engineers, contractors and home-owners. In spite of the difficulties that have been placed in their way, manufacturers have persisted in attempting to develop conversion equipment to a state where it will compare favorably with straight gas-designed boilers or furnaces in economy of operation, safety, and reliability.

Manufacturers of such equipment are faced with the problem of producing an appliance which will have an efficiency but little below that of the gas-designed heater, and at the same time can be sold for considerably less to the owner of a boiler designed for solid fuel. A definite advantage of the conversion equipment lies in its low cost, and if such equipment is made too elaborate, the cost may be so high that it cannot so compete.

Systems of conversion, consequently, divide themselves into two general classes; the first class is composed of those burners which have been developed along the lines of simplicity and low first cost. These units are sold, for the most part, in natural-gas territories, and some of them are not even under automatic control. In other cases, a thermostat is used, but no limit controls or safety appliances are furnished. The second class is made up of units which have been developed by manu-

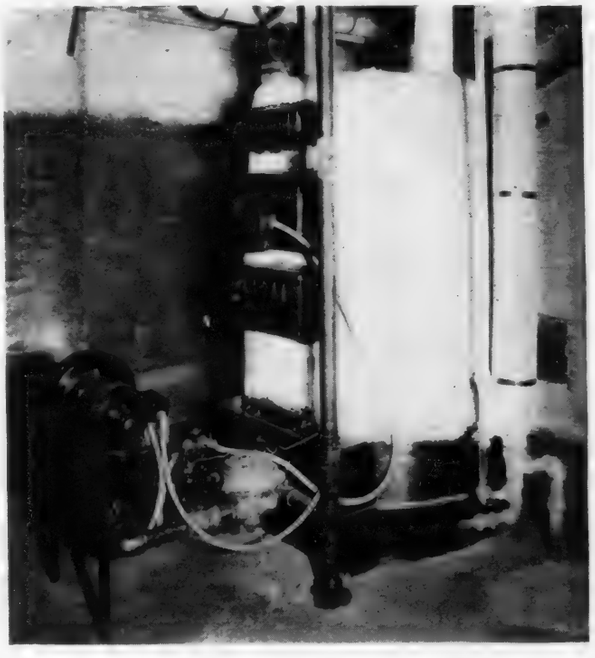


Fig. 1. An Example of High-Class Design, Construction and Installation of a Gas Conversion Unit

facturers whose aim has been to provide for high efficiency, and to equip their apparatus with such automatic controls as will give economy of operation and safety from such dangers as failure of gas supply, extinguishing of pilot and too high boiler or furnace temperature. Burners of the second type usually have originated in the manufactured-gas territories, and this is logical because it is in these localities that the cost of gas is comparatively high, making economical use of the fuel necessary.

However, the division between the two types is not well defined. Some burners in the first class are just as efficient as those in the second; some of them are equipped with the same type of controls. On the other hand, some of the conversions which fall in the second class are, in spite of their complicated and elaborate design, inefficient in operation and quite temperamental as to reliability.

High Efficiency At Less Than Rated Load Necessary for Gas-Fired Heating Equipment

A point brought out at the recent A.G.A. convention was that although the efficiencies of several standard boilers might be the same on the test floor, in actual installations the gas consumption under identical conditions may differ as much as 10%. Some conversion manufacturers have realized that there is a distinct difference between *test floor efficiency*, running at rated load, and the efficiency obtained *over a heating season* during which the boiler may operate at from one-third to one-half of its rated load the greater part of the time. These companies are obtaining valuable figures on the efficiencies of their own units and, in some cases, on coal and gas fired equipment also, under different conditions of load.

Along these lines, to show that such ideas are in the minds of engineers who have recognized that such fractional load efficiencies are of no little importance, the following material by D. S. Reynolds, published in the *Gas-Age Record* for March 3, 1928, is of interest: "Laboratory tests on three boilers of 300 sq. ft. rating, net, steam, gave the following results: On full, 79.4% efficiency; 30 min. on, 30 off, 74.3%; 30 on, 60 off, 69.4%; 30 on, 90 off, 65.5%. Since in the average installation the boiler is on about one-third of the time, the 30-60 test probaby represents ordinary conditions. Apparently, therefore, laboratory tests as well as actual gas consumptions during the heating season indicate that the average efficiency over the whole season, of this size boiler, is between 66% and 69%. With larger boilers this efficiency will probably be greater."

There are so many obstacles in the way of computing a seasonal efficiency, due to the number of variables encountered, that even after such efficiency figures for less than rated loads are determined, it will not be easy to use them. A determination of such figures will, however, represent a great step forward in the attempts to compare different types of gas-designed appliances, conversion equipment and even coal- and oil-burning apparatus used in house heating.

However, until these figures are obtained by some reliable and impartial source, they will not be generally accepted. Until that time, manufacturers of conversion equipment are doing themselves a great deal of harm by claiming efficiencies equal to and greater than those obtained by straight gas-fired appliances. They are not only doing themselves harm, but they are working against the best interests of the gas industry. Statements claiming efficiencies never before equaled are hard to prove, and will be seized upon by those engaged in competing fuel industries as propaganda to show that the literature of the gas appliance interests is entirely untrustworthy. The oil burner industry

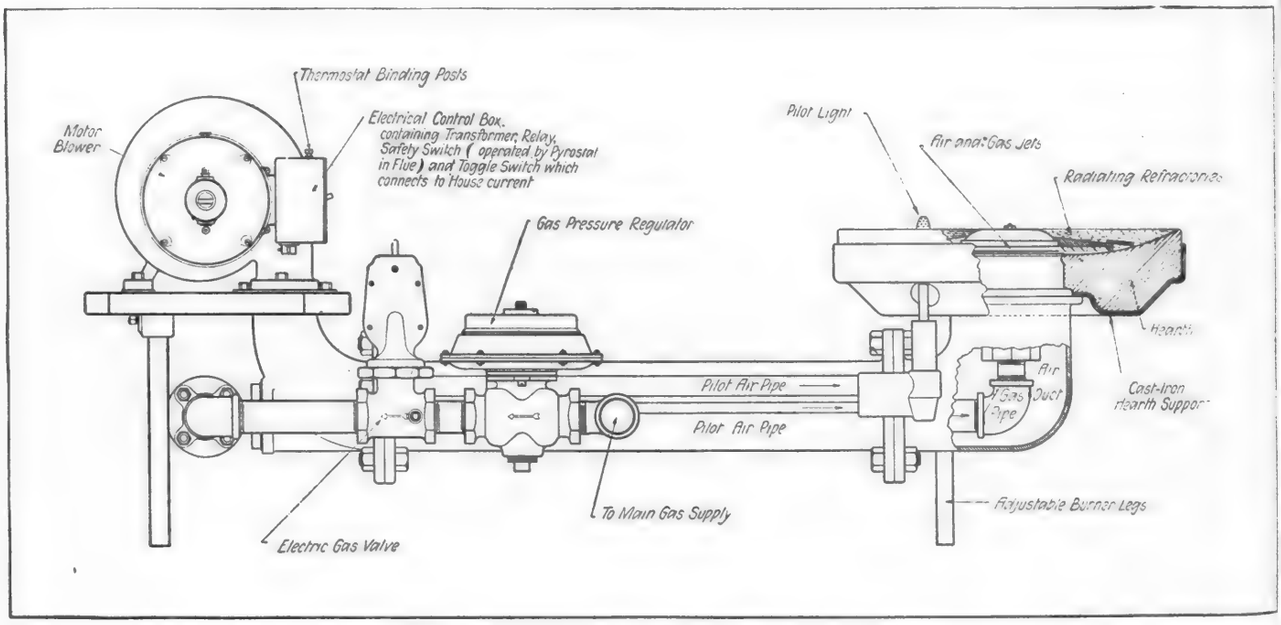


Fig. 2. Assembly Drawing of Unit Shown in Fig. 1.

has gone through a similar experience which, for a time, proved extremely detrimental to those concerned, and gas-appliance manufacturers should profit by this experience.

Conversion equipment can only be approved by the American Gas Association provided it will pass the minimum requirements tests in the association laboratory, and then will be approved only for the specific size, type, and manufacture of boiler or furnace in which it was tested. When it is remembered that there are a hundred boiler manufacturers, and even more furnace manufacturers, all of whom have produced models changed every few years, and each has, and still is producing, at least dozens of sizes in the boiler line and a half-dozen in the furnace line, it will be seen that it would be an impossibility for a conversion to be approved for blanket installation. In spite of the handicap of not being able to secure the approval seal of the laboratory, conversion manufacturers have produced some fine appliances, many of them being reliable, efficient and safe.

Conversion equipment hereinafter described includes those which are best known at this time, at least in the eastern and middle western territories.

A recently announced conversion unit is one developed in Illinois and shown in Figs. 1 and 2. The air is supplied by a centrifugal fan operated by a 1/6 H.P. motor. Air supply is adjusted for each installation by changing the amount of opening at the throttle plate on the fan inlet. Gas and air are piped separately through the ashpit door opening (which otherwise is tightly sealed) to the burner base inside the combustion chamber and thence to the burner head. Mixture of the gas and air takes place at a point ¼ in. back of the circular orifice in the head. This feature eliminates the danger of a flashback, for there is no long mixing tube. The electrically-controlled gas valve and the fan motor are so synchronized that the gas valve can not open until the fan has been set in motion, and when the gas burner is shut off the gas valve closes before the fan stops, the momentum of the latter being sufficient to keep it in motion for a short time.

Issuing from the circular orifice in the head, the gas and air mixture burns between a thin bed of rough-surfaced refractory chips and a hearth of high-temperature refractory material. Surface combustion takes place in contact with the refractory and there is practically no flame, the appearance being similar to that of a bed of burning anthracite.

The Principle of Surface Combustion Utilized in Designing Conversion Equipment

An advantage claimed for surface combustion is that higher temperatures can be attained than are otherwise possible, and there is an increase in the amount of radiant energy developed. Inasmuch as coal-burning boilers are designed for a fuel which, unlike gas, gives off considerable radiant heat in the firepot, this feature is of particular interest.

Ignition is supplied by a continuous Bunsen-type pilot which burns inside of a perforated refractory cap near the outer edge of the hearth. This cap protects the pilot from down drafts in the chimney. A two point pyrostat, which is installed inside the boiler door, will cause the gas valve to be closed if within less than a minute after the thermostat calls for heat the ignition has failed to function. Manual resetting of this device is necessary before the burner can again operate, so that the owner will of necessity investigate the condition of the pilot.

From data obtained from three installations of this equipment the following unit figures were computed:

Sq. Ft. of Water Radiation	Cu. Ft. of Gas per Sq. Ft. of Radiation per Degree-Day
903	0.106
919	0.115
555	0.105

It might be well to include a word of warning to those who use unit figures such as are given above. In the hand-book "House Heating," published by

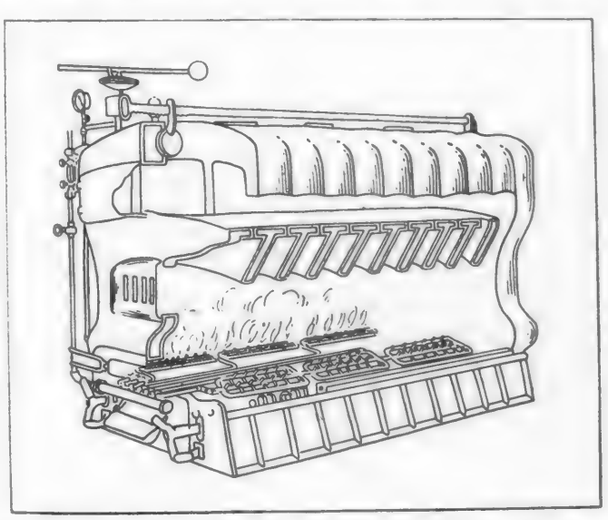


Fig. 3. Construction of One Type of Equipment Showing the Use of a Number of Units to Fit the Particular Job

Fig. 4. An Installation of the Equipment Shown in Fig. 3.

the American Gas Association, a chart* is shown giving average unit figures based on thousands of gas-fired heating installations. From this chart we find that the unit figure, representing cubic feet of gas per square foot of radiation, when 540 B.T.U. gas is burned, is 0.12 for water systems and 0.21 for steam systems for *systems designed for temperatures of* 0° *outside and* 70° *inside.* These figures must be multiplied by a factor to obtain the proper figure for systems designed for any other temperatures; if the design temperature is —10° to 70°, the figures given in "House Heating" must be multiplied by 7/8, so that in cities where the systems are designed for —10° outside, the unit figures would be 0.105 for water systems and 0.184 for steam installations.

Knowledge of Temperature Conditions for Which System was Designed is Important

If the system was designed for 10° to 70°, the factor is 7/6. It can be seen that in the hands of persons who are not familiar with the use of such figures, inaccurate comparisons can be made. In northern cities, if the figures shown in the chart mentioned are not multiplied by the proper factor, surprisingly good results apparently would be obtained, and in more southerly localities, if no correction is made, it would appear that the gas consumption was too high.

Any possible criticism of the data given for the burner just described on the point of over-radiation of the buildings is counteracted by figures which have been included in the original data showing the theoretical amount of radiation required. For these buildings the figures are 1029, 1384 and 533 sq. ft., respectively. No figures are available on the design temperatures for these systems.

A proper interpretation of unit gas consumption figures involves not only a knowledge of the design temperatures for the system in question, but information should be available as to the amount of radiation actually in use and the temperature maintained inside. A building may require a given amount of radiation and have it installed, but if part of the radiation is shut off, the unit gas consumption naturally shows as a low figure—in some cases ridiculously low. On the other hand, some figures which apparently reflect unfavorably on the burner installed may be high, due to the owner maintaining an inside temperature over 70°.

It always has been assumed that setting the thermostat back to a point anywhere from 55° to 65° at night resulted in a saving of fuel. It is interesting to note that in a paper read before the Michigan Gas Association recently, and in another presented at the last A.G.A. convention, it was reported that observations made on gas-fired systems showed that there was no saving in gas when the thermostat was set back.

One of the pioneers among gas-burner manufacturers, whose burner is shown in Fig. 3, has collected a vast amount of installation data concerning its burner. Tables have been prepared showing the size and type of burner for hundreds of different sizes and makes of boilers. With this burner, primary air is admitted in an opening in the side of the burner tube itself, there being no Venturi tubes. The jets, or tubes, are supplied in

*This chart is reproduced on Data Sheet No. 50-A in this issue. Page 98A.

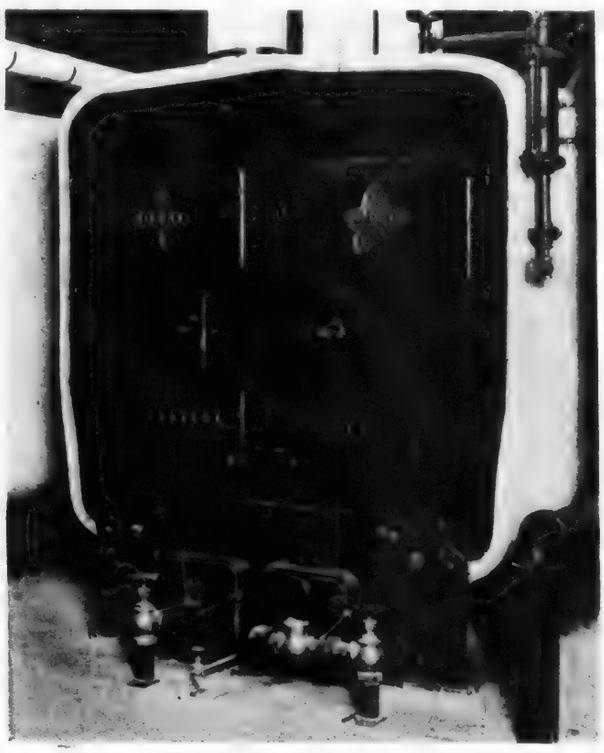


Fig. 5. Simplicity of Piping in an Installation of Burners Shown in Fig. 6

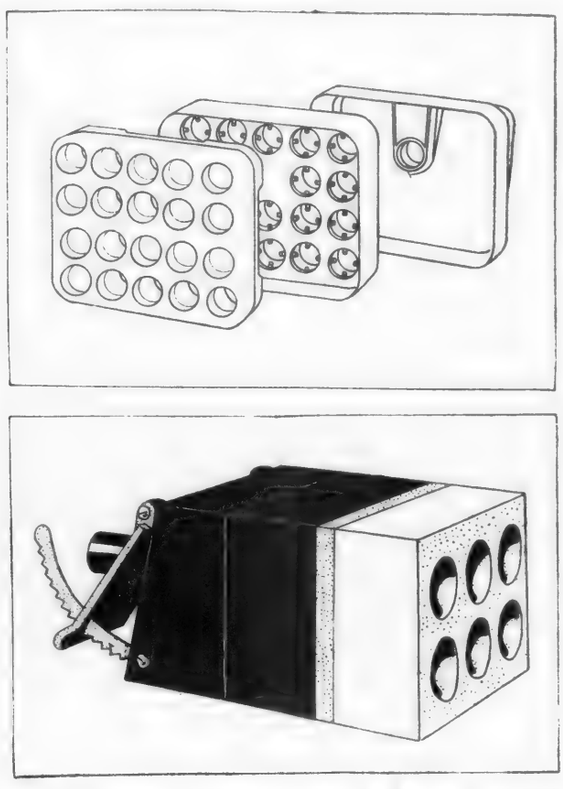


Fig. 6. (above) Constituent Parts of Burner, Assembly of Which is Shown Below

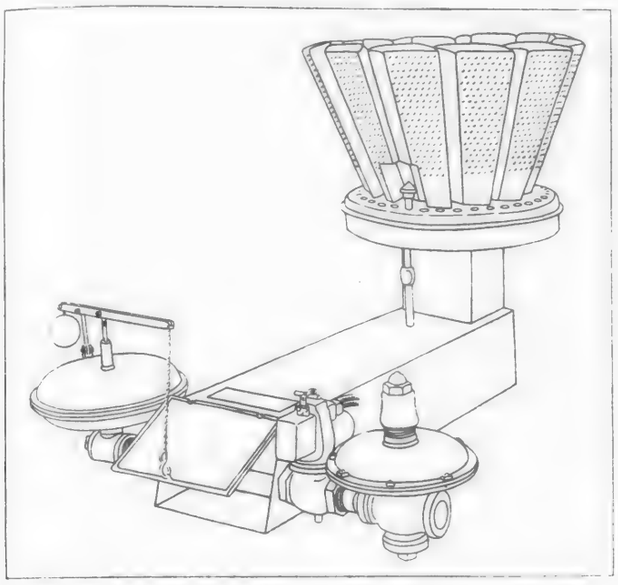


Fig. 7. Refractory Material Used in This Unit to Deflect Flames Against Sides of Boiler

four standard orifice sizes for manufactured gas, and in three sizes for natural and mixed gases. Whether the jets are used in a round, square or rectangular shaped assembly, the jets are always arranged in pairs, and they are so designed that the flame from each jet points toward and mixes with the flame from its mate.

The manufacturers of this burner recommend the use of fire-brick refractory in the heaters in which their burners are installed, so as to reduce the volume of the combustion chamber, and also to force the flames against the sides of the fire pot. They also recommend that in round boilers the openings should be baffled or closed off from 50% to 75%, depending on the available draft. Thermostatic control is advised.

Since this equipment is manufactured in a large number of shapes and sizes, it is possible to adapt it to any type of heater by a combination of the different units. This type burner is standard in some of the latest regular gas-fired equipment, it will not backfire under ordinary conditions, and it is said to give a high efficiency.

The conversion burner shown in Fig. 6 is one developed on the Pacific Coast for use with natural gas. It has been used extensively in power work as well as in heating plants. Refractory material is used on the flame end of this burner, in order to protect the cast-iron parts. Gas is admitted to the burner through the pipe shown at the left of the bottom illustration, and air is admitted to a separate chamber through the door, shown partially open. In the middle block of the top illustration, Fig. 6, made of cast iron, the gas is introduced through jets around the periphery of the large holes, and the velocity of the gas causes the air to be induced, mixing taking place in the refractory mixing block. This burner can be used in boilers equipped with oil burners, there are no parts projecting into the boiler, and furthermore the refractory facing protects the gas burner from the high temperatures of the oil flames. This burner has proved popular on the west coast.

In the burner shown in Fig. 7, the amount of secondary air is controlled by the diaphragm regulator shown at the left. The hinged door on the air duct closes when the gas is turned off, thus preventing an admission of cool air into the combustion chamber when the burners are off. Primary air is induced by the velocity of the gas into the mixing tube, and the secondary air is supplied to the burner at the opening in the casting. The mixing tube in this burner is made of drawn steel, the smoothness of which reduces the friction loss. In cases where the available gas pressure is unusually low it is important that this friction loss be kept as low as possible.

A Burner Adapted to All Types of Boilers, Including Arcolas and Vecto Heaters

Fire-clay "radiants" are used to deflect the flame against the sides of the boiler or the furnace. Projections are cast on the surface of the radiants in order that the heat may be absorbed and given up rapidly, due to the increased surface. A pilot, shown in the front of the burner ring, is equipped with a thermostatic safety which, if the pilot should accidenatlly become extinguished, will make contact and shut off the gas supply valve.

Special burners are available in various size units of this conversion for use in sectional boilers. When installed, the radiants are set at an angle, just as in the round boiler type, so that the flame is directed all around the sides of the front sections and against the back of the rear section. A special type, available in three sizes, is made for converting Arcolas and Vecto heaters to gas burning.

Capacities of the round type burners range from 180 to 550 cu. ft. per hr. for manufactured gas, and from 90 to 280 cu. ft. per hr. burning natural gas. Motor or snap valves can be furnished; thermostatic controls are furnished with the unit, and the company strongly recommends that no installations be made without these controls.

The following figures are claimed to have been taken from installations of these conversions, using 540 B.T.U. manufactured gas:

Sq. Ft. Radiation	Cu. Ft. Gas per Sq. Ft. Radiation per Degree-Day
STEAM SYSTEMS	
400	0.164
272	0.248
859	0.202
WATER SYSTEMS	
489	0.132
404	0.117
800	0.987
750	0.111
387	0.162
318	0.137
750	0.102
655	0.118

(To be continued)

Air Conditioning *in Wisconsin Schools*

Field Observations on Practice Under the Wisconsin Code

By H. W. Schmidt

Superintendent of School Buildings, Department of Public Instruction, Madison, Wis.

DURING the past few years I have had a first-hand opportunity to observe the practical application of the much maligned—as well as much praised—Wisconsin Heating and Ventilating Code as applied to all kinds of installations in many types and sizes of school buildings. Having been a member of the advisory committee which was, in part, responsible for the drafting of the code, I may be pardoned for taking a more than casual interest in the manner in which the code is working out.

In general, especially so far as the results are concerned, the code is on a good working basis. Engineers and designers seem to have no difficulty in applying its provisions in their practice. Contrary to many expectations the code does not limit designers, either in initiative or originality; in fact, oftentimes they seem to exceed the speed limit somewhat in both attributes, to judge from some designs submitted. Of course there are honest differences of opinions on some matters but all have found a cooperative attitude on the part of officials administering the code and a willingness to interpret its provisions in a reasonable manner.

Little if any difficulty exists in interpreting the provisions for heating and for supplying heat losses. Not quite so smooth sailing is found in the designs referring to ventilating. This is quite natural, for this part of the art is not yet a settled matter and is constantly in a state of unstable equilibrium. Investigations and research constantly are throwing new light on the subject, especially in regard to air conditioning, both quantitative and qualitative. The Wisconsin Code permits of 50% air return under certain conditions, without purifying devices, and additional percentage with such devices. Many installations are designed on the former basis but there is no unanimity in working out practical methods of application. Designs submitted vary all the way from attempting to recirculate from all rooms through individual returns or through tapping the main exhaust ducts, to trying to return 5000 cu. ft. per min. through one duct located in a small recitation room. Flexibility in a state code is a fine thing for the expert designer, but is not so good for the garden variety of the species. So we have our troubles.

In this connection I want to comment on the matter of air quantity required. The Wisconsin code makes a provision for air supply based upon floor area (in school buildings), which works out very close to the archaic basis of "30 cubic feet." This of course does not necessarily mean a "primary" supply but, in practice, means an *air movement* of this extent with usually 50% of outside air, more or less, theoretically. The air movement factor is of course recognized today as of more vital importance than a supply of primary or fresh air (I am getting quite a kick out of trying to use these terms to suit everybody) though no one denies the desir-

Fig. 1. A Striking Example of a Warm-Air Installation in Which Fundamental Principles Were Disregarded

Fig. 2. A Warm-Air System That Works and Works Well as Contrasted with That Shown in Fig. 1.

ability of the latter—it is a question of economy of operation.

I now have arrived at a subject on which I have written for THE HEATING AND VENTILATING MAGAZINE. Economy of operation; what sins have been committed in thy name! The Wisconsin code has an order, No. 5825-3, reading; "Operation: All heating, ventilation and exhaust installations shall be operated consistently." There probably is no provision of the code which is violated more (and not only in Wisconsin) than this. In my rounds I constantly find the ventilation portion of the plant shut down while it either operates as a gravity job or not as a ventilating system at all. To supply heat—ah, that is the thing! Never mind air movement so long as the room is 76°—that is comfort!

You cannot *force* this situation. If you *order* proper operation it will be done while you are around. After that, the same old story. It needs a real educational campaign to attain the objective of good air conditioning. In this state we are preaching it, we circularize it and we talk it.

Why "30 Cubic Feet"?

In connection with the matter of air supply and air movement, question the "30 cubic foot" basis. Research has already set up the doubt definitely, but results in practice, mostly subjective, true enough, lead one to the conclusion that a much smaller supply of primary air, and even less air movement than that required by law, is sufficient for bodily comfort and for healthful conditions under all ordinary circumstances.

Let me give a concrete example. In a certain small rural school, with a furnace gravity job, the air flow was checked by means of anemometer measurements (accurate enough for practical purposes). Here are the results: Outside temperature, 18°; no wind; mean room temperature, 70½°; heated air supply, 1005 cu. ft. (required by code 1490 cu. ft. per min.); return air, 585 cu. ft. per min. (58% recirculation); test of 85 minutes' duration. Expression of pupils, teacher and myself: comfortable, no stagnation, good air conditions, etc. Yet what had happened? Air supply 67% of that required, or 21 cu. ft. per min. per child. "Fresh" air 56% of that required by code and custom. At end of this period the air intake was closed and recirculation depended upon. Results: mean room temperature, 74°; air supply, 845 cu. ft. per min.; return air, 760 cu. ft. per min. (balance due to leakage in damper, etc.); test, 55 minutes' duration. Result: Too hot, rather "dull" feeling, air does not "smell good," etc.

In the first case subjective judgment pronounced conditions good although, theoretically, there was not a good air condition; in the second case judgment said poor, no doubt due to over-heating, some reduced air movement and the absence of any amount of primary air. Evidently air movement with a definite, rather large percentage of primary air and low temperature produced good results here, even when the air supply was only at the rate of 21 cu. ft. per min. per child. Of course no claim is made for any scientific accuracy or objective tests or judgments. I don't know whether respiratory diseases (these seem to be the medical criteria of ventilation) would be more prevalent in case one than if 1490 cu. ft. per min. of air had been supplied. But air conditions seemed to be as good. Write your own ticket!

The Wisconsin code, as well as most others, does not specifically call for "space" in which to place apparatus. It is wished that this might be the case. It is surprising how little attention is paid to what often may be considered an important part of design—accessibility of apparatus. Such matters as having to crawl under a portable-type boiler to reach its rear, having to demolish a concrete wall in order to pull boiler tubes, providing a firing space insufficient to handle a slice bar, setting a fan pulley and belt so that one has to crawl under it in order to oil bearings, placing a vent-fan housing and coils over a boiler top with a common ladder used to open valves, etc., are all actual conditions met with both in practice and design. I could cite columns. It is just as often the architect's fault as the error of the engineer; there may well be a code provision to assure proper conditions and spaces for heating and ventilating devices, as well as closer cooperation between those responsible for designs.

It also is found that inspection service on part

Fig. 3. A "Know-It-All" Contractor Put in 55 Ft. of Return-Air Duct Where a 6 Ft. Duct Was Specified and Would Have Provided for Better Operation

of some authoritative body should be required, as practice shows that plans and designs are not always followed by contractors or installers. Sometimes changes and substitutions are ordered by school authorities without knowledge of the engineer or architect. Engineering service should include final inspection and approval as a matter of self-protection, if nothing else.

What we run across in daily work may well be exemplified by photographs. Fig. 1 shows a small furnace job which does not work well at all—for obvious reasons. Note the original opening in the warm-air flue which was bricked up and lowered 2 ft. so that a flat top on the furnace could be used; this in connection with square box ducts played havoc with the whole job. Fig. 2 is not an elegant job, it is admitted, but it works like a charm. Compare the two. Fig. 3 shows to what length a contractor will go to force his own opinion on the job. The return-air duct is actually 55 ft. long, ends at the S.E. corner of the classroom while a 6 ft. duct at the N.W. corner of the room was called for. The difference, I believe, was $50! Fig. 4 shows a supposed fresh-air inlet for a four-room building; it is directly off a sandy playground. The approved design is quite another thing.

The matter of unit room ventilation has intruded itself to a considerable extent, and, although the Wisconsin code does not make specific mention of it, it is accepted as a regular standard device under general orders governing air conditioning and apparatus intended to provide for heat losses. This method also introduced, definitely, so-called corridor ventilation by means of exhaust air from "uncontaminated" areas.

As a comparatively new comer this type of heater and ventilator ran the usual experimental gamut of development; it had its ups and downs and faults the same as any other device. It appears, however, that now it is an established thing and gives, in most instances, excellent service. I have seen quite a number of installations, some of considerable magnitude and, with few exceptions, have found them very satisfactory. In order to satisfy an innate curiosity I checked up a fourteen-room installation, with the results given on Page 63.

A Fresh (?) Air Inlet Almost at Ground Level on the Edge of a Sandy Playground Is an Example of Thoughtless Installation

Before presenting the tabular findings it may be said that the attitude of those administering the code has been favorable to corridor ventilation, accepting the previous definition. The code has been modified to accept this. Interesting enough, not many have availed themselves of this opportunity; most applications are through the unit room ventilators. Wisconsin does not permit the exhausting of all air in corridors through ceiling vents on the top floor of a school building. A definite portion must be exhausted through positive vents placed in corridors at strategic points. It also is permissible to exhaust partly through cloak lockers placed in ventilating niches in corridors. This method of disposing of air has proven very satisfactory in practice and even where large volumes are handled no drafts of consequence are observable. The test results taken in a building with exhaust corridor ventilation are detailed on Page 63.

The units were operated at full load, and anemometer readings, integrated so far as possible, were used to obtain both velocities and volumes. The units were rated at 1500 cu. ft. per min. each.

Column 1 shows the integrated velocity of air at the units. Column 2 gives the cubic feet delivered by the units. This is a mean figure taken over a time period to allow for variations due to wind pressure, which at times was very appreciable. Column 3 gives the code requirements. The total empirical values of column 2 are in remarkable accord with the required volume. The units are evidently delivering very close to their rated capacity. No attempt was made to test the heating capacity either of units or of auxiliary radiation. The influence of wind conditions is shown in Column 1.

As this building had corridor exhaust, it was of interest to observe its working. Door grills approximately 24″ x 28″ were provided above the bottom rail. A number of deflectors were installed so that there was a tendency to throw the discharge down on the corridor side. Anemometer tests showed velocities of 0 on the upper slot, 12 to 40 ft. per min. on the second slot; 72 to 108 ft. per min. on the third slot and 280 ft. per min. on the bottom slot. A high velocity was discerned at the threshold of the door but could not be measured readily. The integrated velocities are given in Column 4 and the approximate discharge in Column 5.

On the above basis, and assuming a pro rata discharge for those rooms not measured, a total of about 8300 cu. ft. per min. was being discharged into the corridors—out of a total of 18,540 cu. ft. per min. discharged by the units. Some leakage in a new, well constructed building! There are two ceiling vents in the second floor corridor ceiling which were discharging about 6000 cu. ft. per min.; the remainder was discharged through positive vents on the first floor.

Due to local conditions, proximity to playground and adverse wind conditions, the need of air filters was definitely indicated by the presence of sand and dust on both units and furniture.

(*Continued on Page* 63)

Principles and Methods of Heat Utilization

Part II—Determination and Reduction of Customers' Heat Demands and Analysis of Preventable Losses

By Prof. C. H. B. Hotchkiss,

Department of Heating and Ventilating Engineering, Purdue University

AT the beginning of any discussion of methods it is of great importance that we once more repeat, "The object of heat utilization work is service to the customer." This service has for its most notable feature the reduction of the customers' bills for steam. While this is, perhaps, the outstanding result, we must fully appreciate that the attainment of this highly desirable situation brings in its train a whole flock of correlated results, both to the utility and to the customer. These combined results determine methods in detail. We may, however, quite readily consider the broad aspects of the problem.

Granted that, in general, the reduction of steam consumption by customers, with consequent lowering of their net costs of securing heat, is the aim and that heat utilization work ideally conducted from that standpoint would result in every customer using heat to his best advantage, the first consideration is that the ideal method would result in exactly that situation.

The first difficulty which arises is the question, "Just how are we to be sure when this condition of best use of steam is actually reached?" From answers to this question have sprung two general types of methods of dealing with utilization work. One might be called the method which sets up a figure to shoot at, practically at the outset; then it proceeds to measures that will cause the customer's consumption to reach this figure. When this figure is reached, work with the particular customer is considered finished except for the follow-up which checks to see that, when once reached, the customer continues to enjoy this economy. The second general method consists of considering utilization work with any customer as a sort of blanket order in which the utility is to do its best regardless of what point of consumption is reached. The first method may be said to be one of estimating in advance and then trying to reach this estimate as a goal. The second method may be called purely a trial method, implying constant effort, regardless of the results.

In using the first method there are several features to be noted. The thoroughness of the work will depend upon how carefully the figure for excellence is determined. The usual method is to estimate the heat loss from the building by a method of cubage, radiation set or required, or by previous coal consumption. Note that the figures forming the basis for these estimates are the same as those used in estimating maximum demand for design purposes. Instead of applying the figures to the estimating of demand they are used to estimate consumptions. Several interesting schemes for doing this have been devised, most important of which is the degree-day method. Efforts constantly are made to keep the customer's consumption within the figures set.

This method appears to have the following advantages:

(a) It lends itself readily to detached check-up methods.

(b) It permits the utilization staff to note very readily how it stands regarding its efforts toward any customer.

(c) It makes record-keeping required, and rather automatic.

(d) It supplies data for showing the customer what is being done by the company's efforts.

The second method—that of trial—consists of surveying the customer's premises as before but, instead of using the data to set up a standard or performance, the survey becomes the basis of recommendations of steps to be taken in securing better use of steam. Anything at all that appears likely to reduce the consumption would be tried and continued as long as possible.

This method appears to have the following advantages:

(a) It makes the work depend on a survey of conditions rather than upon a computed standard of excellence. It makes the sky the limit.

(b) Utilization work under this method, while lacking the systematic features of record-keeping of the other one is less likely to permit the conduct of the work to become stereotyped and a mere following of office procedure.

(c) It reduces records to a minimum and is likely to result in more work in the customer's premises and less work in the office.

(d) It is more likely to keep a staff constantly looking for improvements to be used, and more willing to accept innovations than is the other method.

It will be noted that the principal difference between these two conceptions of proper procedure consists in their answer to the question "*When* is the customer using steam to his own best advantage?" Method No. 1 says: "When the customer's actual consumption reaches our predetermined figure." Method No. 2 answers: "When we have tried everything we know."

If the pre-set figure of the first method is equivalent to the result after the second method has been tried, then the two methods have accomplished the same result—but by different procedures. It appears quite likely that equally good results *can* be accomplished by either. The difference between them are differences of attitude, of conception, and of administration. One method appeals to certain companies and the other appeals to others. Some use combinations.

It is doubtful if a set, prescribed method of attack for all companies would be of optimum value. Actual programs and details of procedure must, of necessity, vary with individual managements.

Having noted something of the general methods followed we now are ready to discuss specific plans. We have spoken of attempts to reduce consumption and of applying our knowledge to this end. Just what knowledge do we have of ways in which steam consumption may be decreased?

It was evident to the committee appointed by the N.D.H.A., as soon as it began its efforts, that if steam savings were possible it was necessary, first of all, to know just *where* these savings might be expected. The committee considered this matter and decided that there are six sources from which heat waste can occur and consequently as many places to be studied. These are:

1. Losses in the condensed steam.
2. Losses due to lack of temperature control.
3. Losses due to faulty operation.
4. Losses due to defective building construction.
5. Losses due to defective heating systems.
6. Losses resulting from defective arrangements.

1. Heat losses from the condensed steam are due to returning this hot water, or else dumping it into the sewer, at too high temperature. Since the charge is by the pound, ordinarily, the loss of this hot water represents the loss of heat.

2. The heat lost from a building increases as the inside temperature rises if the outside temperature is fixed. Keeping the inside temperature higher than necessary means that heat will leave the building faster than necessary. Consequently more steam will be required. Thus maintaining too high a temperature inside represents a loss of heat.

3. If buildings are operated in a negligent fashion unnecessary heat is used. If a building is kept heated to 70° for 24 hrs. a day, and is occupied but 8 hrs., more heat is used than is necessary.

4. If buildings are poorly or loosely built or poorly maintained, heat leaves them much more readily than if they are well constructed.

5. If heating systems are installed with insufficient radiation, or with defective piping, traps, or other parts, the system will use more steam then is necessary.

6. If certain parts of buildings require high temperatures while certain other parts require low temperatures, it is evident that heating the entire volume to the high temperature represents a waste.

With these sources in mind, the next step is to develop means of combating these unnecessary losses. The committee, when considering this, appeared to feel that it should conduct tests and experiments to learn what could be done. In order to cover this in a comprehensive fashion the various possibilities of reducing the waste for the six sources are listed on page 208, N.D.H.A. Proceedings for 1923, as follows:

1. HEAT IN CONDENSATE
   - A. Salvaging heat in condensate
     1. Air heating economizers
        - (a) Indirect
        - (b) Direct
        - (c) Cooling coils at bottom of radiation
     2. Water heating economizers
   - B. Keeping steam out of return lines
     1. Atmospheric type heating systems
     2. Vapor systems
     3. Pressure systems with thermostatic traps
     4. Special traps on heating systems with wet returns
2. LACK OF TEMPERATURE CONTROL
   - A. Manual temperature control
     1. Shutting off entire system during parts of day
     2. Splitting systems so that parts can be shut off separately during the day
     3. Modulating valves on radiators
     4. Varying pressure and vacuum on system
     5. Hot water systems
   - B. Automatic temperature control
     1. Electric thermostatic control on entire system
     2. Electric thermostatic control on split-up system
     3. Thermostatic control in individual rooms
     4. Thermostatic control in individual radiation
3. LOSS FROM FAULTY OPERATION
   - A. Operation in general
     1. Shutting off at night
     2. Shutting off during parts of day
     3. Shutting off unused parts of building
     4. Use of 24-hr. main where necessary
   - B. Check of operation by building manager or engineer
     1. Long distance thermometers
     2. Recording thermometers in sections of building
     3. Recording gages on heating system

C. Incentive for Good Operation
   1. Cost figures made by engineer
   2. Cost figures (comparative) by building manager
   3. Charts kept on building and other buildings made by central station and used as a basis for competition between building engineers or managers.

4. LOSS FROM DEFECTIVE BUILDING CONSTRUCTION
   1. Installation of weather strips
   2. Use of insulation in building construction
   3. Installation of storm doors
   4. Use of revolving doors in vestibules, lobbies, etc.
   5. Use of automatic doors in garages

5. LOSS FROM DEFECTIVE HEATING SYSTEMS
   1. Proper arrangement of piping
   2. Covered piping
   3. Sufficient radiation
   4. Piping properly sized
   5. Defective or lack of radiator traps, (correcting loss from)
   6. Vacuum pump
   7. Properly placed radiation

6. LOSS FROM DEFECTIVE BUILDING ARRANGEMENT
   1. Radiation unobstructed
   2. Building so arranged that sections requiring heat at night can be heated by economical layout of 24-hr. main
   3. Building so arranged that sections not requiring as high room temperature can be controlled separately.

The committee then caused tests to be made to determine the value of these methods, the effort and expense involved, and the savings possible in certain representative buildings. Considerable data resulted. The next step was to evaluate these methods, and to incorporate them, or the most valuable of them, into a booklet presenting these data in a usable form with recommendations for their use. Tabulations of the sources of losses and means for combating them have been so presented that all that remains for the utility to do is make use of them, and by following the outline suggested by the committee, utility companies can realize their aim—service to the customer.

Air Conditioning in Wisconsin Schools

(*Continued from Page* 60)

The question of noise, disturbance, etc., due to these units operating, came up on several occasions. The following questions were asked of sixty teachers in three schools:

1. Do the units produce a noise objectionable to you personally?
2. Does any noise the units make interfere with your conduct and management of the classroom?
3. Do the units, when operating, make it necessary to raise your voice?
4. Do the children object to the noise in a manner discernible to you?
5. Is the unit producing good results in ventilating the room, keeping the air fresh and in motion, as you observe it?
6. Is corridor noise an interfering factor?

The answers are tabulated as follows:

	Yes	*No*	
Question 1	7	49	
" 2	9	49	
" 3	8	51	No. of teachers reporting ..60
" 4	5	52	No. of schools 3
" 5	56	2	
" 6	4	52	

Note: Some teachers did not care to commit themselves on a number of questions.

The results are definitely satisfactory and appear to have remained so after several years of operation, as personal questioning showed recently.

These field observations may be of interest to the reader and exemplify the problems confronting the worker, in a very practical way. Engineering bases have been omitted or minimized so as not to confuse the issue, which consists in "eating the pudding. is a proof thereof."

CONDITIONS OF TEST IN 14-ROOM INSTALLATION

Date: April 15, 1926.
Time: 1:45 to 4:00 P. M.
Weather: Clear, turning murky and somewhat cloudy.
Temperature, Average 41° F.
Wind: Strong S. W. winds, very gusty.
Orientation: Building faces north with major axis east and west, situated on high ground and freely exposed to North, East, and South, slight protection on West.

Room	1. Velocity of discharge, ft. per min.	2. Calculated cu. ft. per min.	3. Cu. ft. per min. required	4. Exhaust Velocity	5. Cu. ft. per min. discharge
S-E	1005	1407	1500		
N-E	940	1306	1500		
S	1100	1540	1500	140	644
Assem. N.	965	2730	2620		
S-W	1120	1568	1500	145	665
N-W	960	1344	1500	125	575
S-E	1040	1456	1500		
N-E	945	1323	1500	135	621
S	1090	1526	1500		
N	960	1344	1500		
S-W	1140	1596	1500	162	745
N-W	1000	1400	1500	135	630
Total		18,540	20,620		

Welding *for the Heating Contractor*

Part II—Characteristics of Pipe Welds

By Horace E. Wetzell

Chief Engineer, The Smith & Oby Company, Cleveland

IN studying the tests which have been made on pipe welds since 1924, when this study was begun, it was noted that the reports were sponsored and being advertised by advocates of either the gas or electric weld. Naturally tests were used which showed their particular process to the best possible advantage. Considerable data were to be had through sources connected with gas welding, but comparatively little information could be found regarding electric pipe-welds. In 1924 practically all pipe welding in Cleveland, O., was being done by the gas method and was proving very satisfactory. Therefore, in order to determine whether the electric arc could produce satisfactory welds in competition with the gas method, I arranged with the Westinghouse Electric and Manufacturing Company to conduct a series of tests. I was present while these tests were made and consider them authoritative. The report prepared at that time, giving the results of these tests, was as follows:

In order to determine the value of an arc-welded joint in standard steel pipe, a series of tests was made on National Tube Company's standard 6-in. pipe in which all of the joints were arc-welded. In order that an average result might be obtained, the joints were made in three positions.

The pipe samples to be welded consisted of 12-in. lengths of standard 6-in. pipe. The ends to be welded were beveled at 60°, leaving approximately 1/16-in. shoulder between the bottom of the bevel and the inside of the pipe. The opposite ends of the pipe were threaded for standard 6-in. pipe coupling. The welding was done in two layers, the first layer being well brushed with a stiff wire brush before the second layer was applied.

Tests

No. 1. One set of welds was made on samples of this pipe, joining the two sections together by doing the welding in a horizontal position and rolling the pipe as the welding progressed.

No. 2. A second set was made using the same size pipe but in this case the pipe was secured in a vertical position and the weld made on the hori-

zontal seam around the pipe, the operator moving around the pipe which was held stationary.

No. 3. The third test was made on the same pipe with the pipe held rigidly in the horizontal position. In this case it was necessary to weld this pipe in the flat, vertical, and overhead positions.

To weld the first specimen required an average of 24 ½ min. per joint, using 0.967 lb. of welding wire and approximately 2 kw.-hr. of electrical energy per joint.

The second set of specimens, or the vertical test pieces, required an average of 25 min. to weld. An average of 1.36 lb. of the wire was used and approximately 2.3 kw.-hr. of electrical energy.

The third specimens, or horizontal test pieces, were welded on an average of 33 min. per joint using 1.4 lb. of electrode wire and an average of 2.7 kw.-hr. of electrical energy.

Tensile Tests

After being welded, a sample of each test pipe was cut into strips about 2 ⅜ in. wide, making tensile-strength test pieces which were pulled to destruction in a tensile testing machine. It was found that the first specimen developed an efficiency of 96.25% of the tensile strength of the original pipe material. The second test, or the vertically welded pipe, developed a tensile strength of 90%, and the third or horizontal test specimen developed an efficiency of 95.75%.

One or more of the strips from each set of specimens broke outside of the weld in the original pipe, so we considered this tensile strength as the tensile strength of the original pipe, and on this basis computed the efficiency of the welded joint.

Caps were made by blocking off one end of the standard 6-in. couplings by arc-welding a disc into them. With one of these caps on each end of the welded specimen a hydraulic pressure of 550 lbs. was applied to each specimen without any signs of leakage at the welded joints. When maintaining a hydraulic pressure of over 100 lbs. a specimen from each set of tests was subjected to a crushing pressure at the welded joint. This pressure was applied by squeezing the pipe between the 2 ½-in. bars. It was found that the screw joint at the end caps began to leak badly long before the joint had been appreciably deformed. The tabulated results show the extent to which the pipe was crushed before the screw joint leaked so badly that further crushing had to be abandoned. In two cases a sample of pipe without water in it was crushed and it was found that the pipe welded in the vertical position (Test No. 2) was crushed from its original diameter of 6 ⅝ in. to a diameter of 2 ⅜ in., using a pressure of 35,000 lbs. before the weld showed any sign of cracking at the surface. A specimen of pipe welded in the horizontal position (Test No. 3) was crushed from 6 ⅝ in. diameter to a diameter of 5 1/15 in. using a pressure of 24,500 lbs. before evidence of cracking was discovered in the weld.

In order to obtain a comparison, a section of pipe coupled with a standard 6-in. pipe coupling was put under 100 lbs. hydraulic pressure and subjected to crushing as was done with the welded pipe. By the time the coupling was deformed 3/16 in. in diameter the joint was leaking so badly that it was impossible to hold a pressure of 100 lbs.

Results of Tests on Arc-Welded Pipe

The following table is a summary of tensile tests on arc-welded pipe:

Sample 1—Welded in horizontal position with work rolled as welding progresses so that welding is always done on top.
Sample 2—Welded in the vertical position.
Sample 3—Welded in the horizontal position with work held stationary (some overhead welding required).

Tensile Tests

Mark	Width In.	Load Lbs.	Lbs. per Lin. In. of Joint	Remarks
1-1	2.375	37030	15587	Broke in pipe
1-2	2.125	36000	16941	Broke in joint
1-3	2.4375	32000	13128	Broke in joint
1-4	2.3125	31000	13405	Broke in joint
1-6	2.3125	36150	15632	Broke in joint
1-7	2.1875	34300	15680	Broke in pipe
1-8	2.000	29450	15308	Broke in joint

Average strength per linear inch of joint 15050 lbs.
Average strength per linear inch of pipe circumference, 15633 lbs.
Efficiency of joint 96.25%.

Mark	Width In.	Load Lbs.	Lbs. per Lin. In. of Joint	Remarks
2-1	2.500	39900	15960	Broke in joint
2-2	2.9375	34900	14120	Broke in joint
2-3	2.78125	46900	16863	Broke in pipe
2-4	2.4375	32000	13130	Broke in joint
2-5	2.3125	39150	16864	Broke in pipe
2-6	2.375	34500	14510	Broke in joint

Average strength per linear inch of joint, 15281 lbs.
Average strength per linear inch of pipe circumference, 16864 lbs.
Efficiency of welded joint 90%.

Mark	Width In.	Load Lbs.	Lbs. per Lin. In. of Joint	Remarks
3-1	2.1875	33000	15085	Broke in pipe
3-2	2.5625	34000	13240	Broke in joint
3-3	2.500	35650	14270	Broke in joint
3-4	2.1875	30800	14085	Broke in joint
3-5	2.40625	36900	15325	Broke in joint
3-6	2.1875	32050	14675	Broke in joint

Average strength per linear inch of joint, 14448 lbs.
Average strength per linear inch of pipe circumference, 15085 lbs.
Efficiency of welded joint 95.75%.

100 Lbs. Hydraulic Pressure Transverse Tests

Test No.	Original Diameter In.	Deformed to In.	Load Lbs.	Remarks
1	6.625	6.0625	28000	Leaked at screwcaps
2	6.625	5.5625	30100	Leaked at screwcaps
3	6.625	3.5625	36000	Leaked at screwcaps
Screwed coupling				
	7.458	7.1705	36200	Leaked at screwcaps

Note: No leakage occurred in the welded joints in this test coupling.

Empty Pipe Transverse Tests

Test No.	Original Diameter In.	Deformed to In.	Load Lbs.
2	6.625	2.75 x 8.9375	35000
3	6.625	5.0625	24000

Note: Loading continued until weld showed failure.

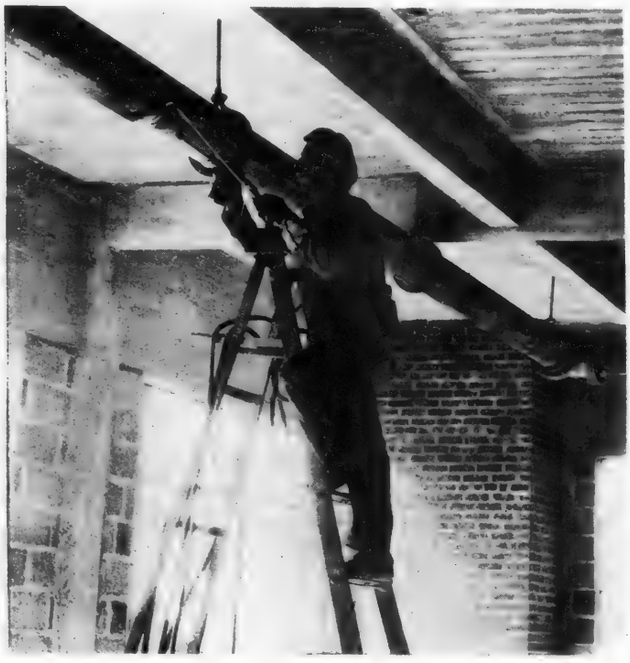
Conclusion

From the foregoing results it is concluded that it is possible to make an arc-welded pipe joint, in any position, that will develop a far greater efficiency than a standard pipe fitting. The joint will stand severe mistreating by bending or crushing without failure. It is evident that the pipe will withstand pressure far in excess of any ordinary working pressure usually applied to this grade of pipe. The fact that it will stand up to such severe treatment without leakage makes it especially advantageous to use this type of joint in laying gas, oil, water or steam lines, where, with the screw-threaded type of joint, there is considerable maintenance and where great losses might occur from leakages.

Viewed From Another Angle

An extract from a paper by H. B. Iglehart, entitled "Autogenous Pipe Welding," which was read before the International Acetylene Association at its annual convention in New York City, in 1921, follows. This paper is representative of many of the reports available from this source:

We cannot well afford to break anything to pieces to ascertain its strength. We have the same methods and ways of testing the strength of a pipe weld that we have for testing any other kind of joint. To substantiate these statements I will describe some of the research operations carried out this year in the shops of the W. K. Mitchell Company, of Philadelphia, for the purpose of demonstrating that welded pipe-joints, when properly made, are strong.



Tacking a Main Steam Line Preparatory to Welding Joints

Early in the year, the Power Piping Society requested the W. K. Mitchell Company to supply it with data on tensile strength tests of welded joints. A long series of tests was made. The following are condensed memoranda of the findings: All specimens were cut from a length of 8-in., 28½-lb. steel pipe. They were about 13 in. long and 2¼ in. wide and were milled down the center to about 1½ in. in width, for a clear length of 6 in. A greater length could not be used in the machine at that time but, of course, a 17 in. length would give greater accuracy in yield points and elongations.

Details of Methods Used in Testing Welded Joints

The longitudinal strips, without any welds, averaged 57,625 lbs. tensile strength. The longitudinal strips were not flattened except at the extreme ends for the grip of the testing machine. This flattening was done cold under the steam hammer. Longitudinal strips, with oxy-acetylene welds in center, averaged 55,895 lbs. breaking strength, or an efficiency of 97% of the pipe metal. Longitudinal strips, with D. C. electric welds in center averaged only 44,245 lbs., an efficiency of 78%. The broken electric welds showed porosity and crystallization, presumably due to poor grade of welding wire having been used by mistake. The longitudinal strips were welded and then were cut up into 2¼-in. strips. Circumferential strips were welded after being cut off and straightened. The straightening was done by slow pressure, the strip being heated to a dull red. Circumferential strips, free of any welds or joints, averaged 59,125 lbs. tensile strength. Circumferential strips with the regular mill lap in center, averaged a breaking strength of 57,975 lbs., an efficiency of 98%. Circumferential strips, with oxy-acetylene welds in center, averaged 58,385 lbs. or an efficiency of 99%. The circumferential strips with D. C. electric welds in center, averaged 54,515 lbs., being an efficiency of 92%. All welds were made from the outside of the pipe only, as would be done in regular practice.

The circumferential strips averaged about 4½% stronger than the longitudinal specimens. Possibly the heating for straightening affected it some. That is a metallurgical question rather than one of welding. For the sake of complete information, a few specimens were welded from both inside and outside. When tested they showed no gain in strength, which proved that the pipe welded from the outside only, secures all of the obtainable strength. Many of the previously mentioned breaking tests did not break in the weld or close to it, which shows they often reach the full 100% mark.

(To be continued)

Flexibility in Heating Systems

A Resume of Progress in Developing Equipment to Function in Accordance With Heat-Load Variations

By Charles F. Wolfsfeld

FLEXIBILITY well might be labelled the paramount pre-requisite of most forms of mechanism and construction. In the case of a heating system, failure to incorporate this element may result in waste, discomfort or personal ailment and may prove disastrous in the case of building construction or the erection of public works.

A steam radiator designed for an hypothetical heat loss will be approximately correct in size for only a few days during the heating season. At all other times it either will be undersize or oversize, assuming steam at a constant pressure.

Attempts to secure flexibility in the heating emission of a radiator have been made, in the past, in several ways. The first step in this direction was the control of the hand valve in the radiator inlet connection. As the room temperature fell below normal, the valve would be opened wide and, conversely, as the temperature rose above normal, the valve would be shut. While such a manually controlled positive-acting arrangement, with its accompanying intermittent heat supply, seems crude in these times, it was a decided improvement over the fireplace and coal stove.

In an attempt to control the steam-supply valve automatically, several types of thermostatic systems have been developed which have proved satisfactory in point of operation as well as economy. However, a radiator alternately *full* of steam and entirely *devoid* of steam results in considerable irregularity in room temperature. This is not so marked in weather which approximates that upon which the radiation calculations were based; but as the outdoor conditions become more moderate, the effects of sudden overheating and lag in cooling are much more noticeable, especially in the case of cast-iron radiation, which retains heat for long periods.

The idea quite naturally presented itself to adapt a radiator of fixed size to varying demands by *partly* filling the radiator with steam. The first attempt in this direction was to reduce the supply of steam to the radiator by manipulating the valve. On one-pipe connections this proved unsatisfactory, inasmuch as the restricted opening thus formed held up water of condensation, producing water hammer. While this difficulty was remedied by making two-pipe connections to radiators, it is doubtful that a partial closing of the supply valve resulted in partially filling the radiator with steam. With air removed from the system, it has been found that a slight leak in a valve will cause an entire radiator to become filled with steam. As a further refinement, there was developed the popular modulation steam radiator valve. This, in most cases, is merely a quick-opening valve, usually of the packless variety. To facilitate detecting the degree of valve opening, the valve is provided with a finger or pointer and a dial reading ¼, ½, ¾, full opening, etc.

In order to vary the quantity of steam flowing to a radiator, by partly closing the ordinary hand valve or the quick-opening valve, it is essential that the piping system be designed with the utmost precision as regards pressure drop, length and type of run, resistances, etc. That is, the system must be so proportioned that, with any radiator supply valve wide open, the radiator will get a quantity of steam, the heating effect of which will be equal *exactly* to the heat loss for the respective space, no more and no less. Under such a condition the least resistance introduced by the partial closing of a valve would reduce the quantity of steam below the maximum which the radiator is capable of condensing.

Methods of Obtaining Flexibility

Although it may seem far-fetched to go to this refinement in ordinary practice, it is probable that a system designed along the lines of a well-balanced hot-water heating system could function in the manner described as regards circulation in the radiator. A special type of steam heating system developed in recent years employs resistance plugs, having openings of various sizes for the passage of steam. These plugs or bushings are used in the inlet openings to the radiation, the orifices being sized according to the steam consumption. Such a contrivance very materially simplifies the design of the system. There are also a number of varieties of adjustable port-opening modulation steam valves on the market which contain provisions for varying the maximum port opening in addition to the feature of hand modulation. These valves embody, in principle, the quick-opening hand valve together with the resistance bushings previously mentioned.

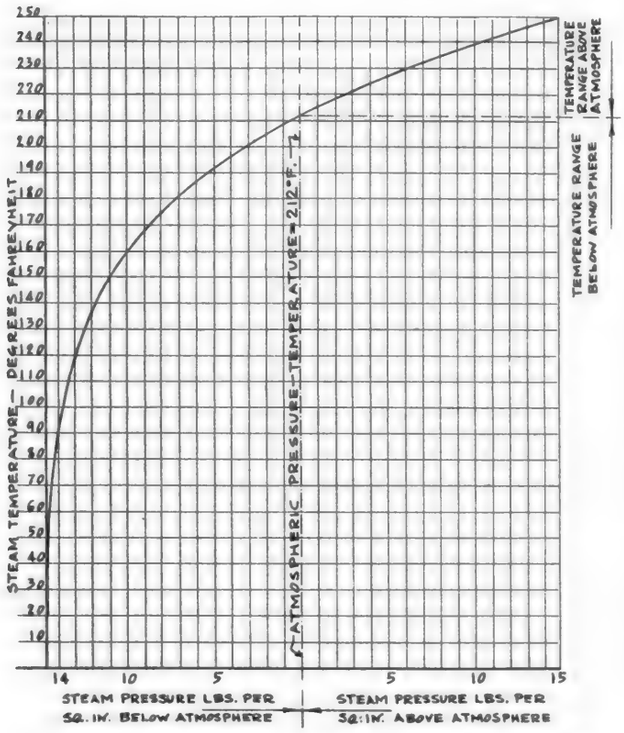
As one method of establishing flexibility we may therefore list *variation of the quantity of steam supplied to radiation by controlling the supply valve.*

A second expedient in varying the heating capacity of a system consists in *changing the temperature of the heating medium within the radiation.*

Under this heading, the engineer's thoughts will instinctively turn to warm-air and water heating, although steam is rapidly gaining a place among the multi-temperature mediums. When one considers that the temperature of steam can be varied from 101° F. at 28 in. of vacuum to 227° at 5 lbs. pressure, it appears that decided flexibility can be secured by utilizing this characteristic. A steam gravity system operating at 5 lbs. pressure is not unusual, although the pressure in common practice varies from several ounces to 1 lb. The entire range of flexibility for a steam system, of course, could be above atmospheric pressure. The cast-iron boilers and radiators in ordinary use being designed for pressures not exceeding 15 lbs. steam (30 lbs. test), the maximum temperature allowable under such a system would be 250° F. Here the total temperature range above atmospheric pressure is 250 — 212 or 38° F. For a pressure range from atmospheric pressure to 14 lbs. below (28 in. vacuum), the temperature range would be approximately 122° F.

It is apparent, therefore, that the *range below atmosphere is about three times as great as the range above atmosphere.* A well-known manufacturer of heating specialties, in presenting his claims, asks the question: "Should the vacuum extend into the radiators?" He may be paving the way for yet more flexible heating.

In operating a steam system above or below atmospheric pressure certain difficulties and conditions of operation merit consideration:



Curve Showing Temperature of Saturated Steam Corresponding to Various Pressures Above and Below Atmosphere

1. PRESSURES ABOVE ATMOSPHERE
   a. Escape of steam through leaky valve packing, joints in radiation, piping, etc. (Heating value of radiators not materially affected thereby).
   b. Greater expansion of piping due to higher temperatures aggravating leaky condition.
   c. Higher temperature of air currents created by radiator increasing carbonization of dust particles, discoloring ceiling, etc.
   d. Lesser economy of fuel due to heavier firing required to maintain higher pressures.
2. PRESSURES BELOW ATMOSPHERE
   a. Admission of atmospheric air through leaky valve packing, joints in radiation, piping, etc. (Heating value of radiation decreased due to chilling and pocketing of air within system).
   b. Development of leaks in old installations due to pressure conditions being reversed. Greater external pressure dislodging scale, particles, etc., which formerly held openings shut against the internal pressure of steam.
   c. Larger radiators required due to lower temperatures of steam.

While advantages and disadvantages can be claimed for both types of systems, the extreme flexibility of the lower pressure range should tip the scales in favor of the "vacuum" system, that is, the system which operates at pressures below atmosphere.

Vacuum steam heating systems may be divided into two classes:

A.—Systems in which the vacuum is created in the entire system by condensation of steam, the water of condensation being returned by gravity. This usually is accomplished by applying non-return (vacuum) air valves to the radiation and mains, or by exhausting air from the system by means of ejectors, pumps, etc. This type of system is very flexible as a whole, in that it can be operated either *above* or *below* atmospheric pressure.

B.—Systems in which a vacuum is created in the return line only. In such systems the water of condensation usually is returned to the boilers by specially designed pumps, the displacement of the pumps creating the vacuum. In order to prevent the passage of steam from the radiation and dripped steam mains into the return, traps are generally used. Such a system assures rapid circulation due to mechanical removal of condensate and air, but aside from this consideration, the "vacuum pump return system" as a whole is quite rigid as regards pressure or temperature range. With a pressure of only 2 lbs. in the radiator (218°) and a vacuum of 10 in. (mercury gauge) in the return, the high temperature of the condensate compared with the boiling point of water at 10 in. of vacuum (192°) would cause the condensate to flash into steam with a consequent reduction of vacuum. As either the pressure of steam or the

(Continued on Page 73)

Heating and Ventilation Specifications

Part VIII—Scope of Specifications; Employees; Sub-Contracts

By Harold L. Alt

A GENERAL paragraph covering the construction of the specifications and their method of being construed, as well as concerning minor items which may not be specifically mentioned, is given in GC-29.

> GC-29 SCOPE OF SPECIFICATIONS:
>
> Nothing herein contained shall be construed to relieve the contractor from doing good and perfect work in all details of construction, and he will be held to provide and install all materials and shall furnish all labor, water, apparatus, light and power necessary for the complete, prompt, and satisfactory execution of the work and for properly connecting and co-ordinating his work with that of other contractors. He shall bear all expenses incident to the satisfactory completion of the work embraced in or contemplated by these specifications and drawings.
>
> Any work called for in the specifications but not mentioned on drawings, or called for on drawings but not mentioned in specifications shall be furnished as though called for in both.

Specification No. 1 contains nothing exactly along this line and Specification No. 2 has a paragraph headed "Scope" which more fittingly could be called "Description of Work" or "Work Included." The paragraph will be quoted in its proper place.

Specification No. 3 reads:

QUALITY MATERIALS AND WORK:

All work described in these specifications or shown on the drawings, and all work necessary to the complete finish of the work so described or shown, is to be executed in a thoroughly substantial and workmanlike manner.

Specification No. 4 refers back to the General Conditions of the General Contract, while Specification No. 5 goes into the matter very much in detail:

SCOPE AND INTERPRETATION:

(a) It is the intention that these specifications, as modified and amended by the specific specifications and drawings (if any) in respective case shall provide in each case for the erection of an equipment or repair complete in all its parts, except such portions of the work as are not provided for in the specific specifications. Any work which may evidently be necessary to complete the equipment or repairs, shall be furnished by the Contractor as being included in his contract.

(b) Any doubt as to the meaning of these specifications, or any obscurity in the wording (except for electrical work, for which see paragraph headed "Department of Water Supply, Gas and Electricity"), shall be interpreted by the Superintendent, who shall give all directions or explanations required or necessary to complete any of the provisions of these specifications and to give them due effect.

(c) Unless distinctly otherwise so stated in the attached specific specification applying to this contract, this standard specification shall be taken as applying to all work (altered or new) mentioned or specified in such specific specification.

(d) No paragraph or portion of paragraph of this standard specification, applying to any work or portion of the work of the contract, shall be considered as modified or void unless distinctly so modified or voided by the attached specific specification, or unless unquestionably not applying to the work of such contract. For exact extent and nature of the work of the contract, see respective specific specification, hereto attached.

(e) The Contractor shall furnish all labor, implements and materials required in the construction of the work in order that it may be completed in every respect according to the drawings and specifications and interpretation thereof by the Superintendent. Anything shown on drawings and not mentioned in the specifications, or vice versa, shall be done as if mentioned in both.

Specification No. 6 has a heading called "Scope of Work" which is really a discussion of "Work Included" and this will be quoted later in its proper place.

The next subject—a most important one—is that of *quality* of workmanship and materials. Second-hand material, imperfect or inferior material, must be guarded against as far as possible just as the employment of cheap and unskilled labor must be prevented. In order that the Contractor may have

absolute and definite information as to the kind of material and labor upon which he is to figure, GC-30 is phrased to leave no loop hole for a misunderstanding to arise on that score.

GC-30 QUALITY OF MATERIALS AND LABOR:

All materials, unless otherwise specified, shall be new and of the best quality and the most approved of their respective kinds.

The workmanship, in all respects, shall be of the highest grade, and all construction shall be done by men skilled in parts they are given to do.

All work must be done under the instruction of, and to the satisfaction of, the Engineer and Architect, whose decision on all points of difference, and concerning the requirements of the drawings, specifications or contract in executing this work, shall be final and binding on this Contractor.

The Contractor shall not do any work without proper drawings or instructions, and shall, at his own expense, replace any work wrongly executed, whether from lack of such drawings or instructions or otherwise.

Specification No. 1 follows along the same general idea.

> All materials, unless otherwise specified, shall be new, of the best quality and the most approved of their respective kinds. The workmanship shall in all respects be of the highest grade, and all construction shall be done according to the best practice of the trade.
>
> The appliances and materials named herein have been selected as best adapted for the purpose intended and the Architects reserve the right to reject any appliances or materials, which, in their judgment, are not equal to those specified or are not installed in accordance with these specifications.
>
> The Heating and Ventilating Contractor shall provide when required, for the approval of the Architects, satisfactory evidence to show the kind and quality of materials and appliances which are to be used, and shall furnish labeled samples, if required, the materials and appliances installed in this work to have the same character and finish as the approved samples.

Specification No. 2 does not say anything on this subject, but Specification No. 3 states:

> All work, materials, fixtures and apparatus shall be first-class in every respect, all shall be equal, in the opinion of the Commissioner, to those specified and all shall be delivered upon the completion of the building in a perfect and undamaged condition, without exception.

Specification No. 4 refers back to the General Conditions of the General Contract.

Specification No. 5 states:

> The workmanship and materials in all cases shall be of the best quality and shall at all times be subject to the inspection, direction and supervision of the Superintendent who shall be afforded facilities for inspecting all parts of the work, and who may reject all workmanship and materials which do not conform with the intent of the drawings and specifications. All such condemned work or materials shall be removed forthwith and immediately substituted with material considered proper and acceptable. Failure to exercise such power, however, shall not be construed or held by the Contractor as an admission on the part of the Superintendent that the work, or any part thereof, has been faithfully performed in case the fact shall be otherwise.

Specification No. 6 avoids the matter altogether.

After outlining in general the quality of workmanship desired, the matter of "Employees" and the Contractor's own services on the contract are described so that everything expected of the Contractor and his employees will be known in advance by the Contractor, and his price figured accordingly.

Usually a Contractor is supposed to devote part of his personal services to carrying out a contract, as well as to have a competent superintendent on the job at all times during working hours. His mechanics are expected to get along with the mechanics of other contractors working on the building without friction and with a co-operative spirit. If any of them should fail in this they can be removed by a demand from the Engineer or Architect as provided for in GC-31.

Specification No. 1 covers this same ground in the following manner:

> The Owner reserves the right to let other contracts upon the building previous to the completion of the work included in this contract and this Contractor shall not interfere with the delivery, handling and storing of materials nor prevent access to the building for the execution of such other contracts and shall co-operate with such other contractors in such manner as to most facilitate the completion of the work as a whole.

CONTRACTOR'S SUPERVISION AND FOREMAN:

The Contractor shall give his general personal supervision to the work, both at the site and at the shops.

He shall keep a competent and responsible foreman in charge of the work and at the site to represent him, whenever any work is in progress, such foreman being authorized and instructed to receive and execute the instructions and directions of the Owner or Architects, and all instructions given to such foreman shall be deemed as having been given to the Contractor. Such foreman shall be subject to the approval of the Architects, shall give his undivided attention and time to the work under this contract and shall not be removed or replaced without the previous consent of the Architects. Approval of the foreman holds good only so long as he proves satisfactory to

GC-31 EMPLOYEES:

Supervision:

The Contractor, as part of his services, shall give personal supervision to the work, and he shall carefully study and compare all drawings, specifications and other information given to him by the Engineer (or Architect) as to figures, materials and methods of construction, using therein the skill and experience for which he receives compensation under this contract, and shall immediately report to the Engineer (or Architect) for rectification, any error, inconsistency or omission therein which he shall discover.

Superintendent:

The Contractor shall keep a competent superintendent or general foreman and any necessary assistance, satisfactory to the Engineer (or Architect) in charge during the progress of the work. The general foreman shall not be changed except with the consent, or at the instance, of the Engineer (or Architect). The foreman shall represent the Contractor in his absence and all directions as to the conduct of the work given to him shall be as binding as if given to the Contractor; that on request such directions be given in writing.

Workmen:

No one unskilled in the work which he is given to do shall be employed, and all work shall be executed in a skillful and workmanlike manner. All men employed upon this work shall be competent, faithful, orderly and satisfactory to the Owner, Engineer and Architect. Should the Engineer (or Architect) deem any one employed on the work incompetent or unfit for his duties, and so certify, the Contractor shall dismiss him, and he shall not be again employed upon the work without permission of the Engineer (or Architect).

the Architects, and shall not be a waiver of the right to require the dismissal of such foreman should he become unsatisfactory.

All of the work must be performed in an acceptable manner and by competent mechanics. Should the Architects deem any of the men employed on any part of the work to be unfit for their duties, or otherwise objectionable, or a hindrance to the progress of the operation, they shall have the right to require their discharge. Any man so discharged shall not be again employed upon the job.

Specification No. 2 refers back to the General Conditions of the General Contract.

Specification No. 3 states (in connection with the Contractor's and superintendent's duties and power to cause removal of unsatisfactory mechanics) the following:

The contractor is to give his own personal superintendence and direction to the work, keeping a competent Superintendent constantly on the ground, to whom the Commissioner, through his assistants, may give all such instructions and directions as may be necessary during the prosecution of the work in the absence of the contractor.

The Commissioner shall have the right and authority to cause any employee found undesirable to leave the premises at once, and to order the work wholly or partially stopped until the objectionable man or men are removed from the grounds.

Specification No. 4 refers to the General Conditions of the General Contract and Specification No. 6 does not contain anything on this matter. Specification No. 5 says:

The Contractor must devote his time and personal attention to the work, and shall employ and retain at the building from the commencement until the entire completion of the work, a foreman competent and capable of maintaining a proper oversight and care of the work and acceptable to the Superintendent, who, in the absence of the Contractor, and irrespective of any foreman employed by any sub-contractor, shall see that the instructions of the Superintendent are carried out.

Rare is the contract which finally is carried out exactly as originally contemplated. Changes are bound to crop up, from time to time, and the Specification must provide for its own alteration to suit later developments. At the same time any changes in the work, as called for in the original layout, should only be made after being duly authorized in the manner provided, because the Owner can claim that any changes made outside of those regularly authorized were made without authority and in *violation of the specification.* Arguments relative to the value of the work involved in the changes also should be avoided as far as possible. In GC-32 this is covered in short and concise terms:

GC-32. ALTERATIONS AND ADDITIONS:

Alterations and additions shall be made only on the written order of the Engineer (or Architect) and this order shall state the sum to be added to, or deducted from, the contract price for such changes. This order shall accompany the bill when the charge for the extra work is made, and without this the charge will not be entertained. Such changes shall not affect the validity of the contract.

Additions or omissions shall be made at a price in proportion to the price covering the work embraced in these specifications.

Specification No. 1 handles this in a slightly different manner as will be seen by the following extract:

The Owner shall have the right to make any modifications in the drawings and specifications that may be deemed advisable by him before or during the prosecution of any contract. Any modifications that may involve extra work shall be estimated upon by the Contractor at the time they are made. If the estimate is satisfactory to the Owner he will order the work to be done at a price agreed upon in writing. The Owner, however, reserves the right to give orders for such extra

GC-33 SUB-CONTRACTS:

This Contractor shall not sublet or assign this contract, nor shall any part of this contract be sublet or assigned without the consent of the Engineer (or Architect) in writing.

This Contractor, in subletting any part of the work, shall make contracts by which his sub-contractors shall be bound by the terms of these Contract Documents as far as applicable to the work sublet.

No sub-contract shall be made which the Engineer (or Architect) cannot, upon three days' written notice, require this Contractor to terminate, if such sub-contractors, in the opinion of the Engineer (or Architect), shall delay the work, or in any way fail to conform to these specifications. The employees of the sub-contractors shall be under the same control of the Engineer (or Architect) as is required of the employees of this Contractor.

All sub-contractors shall be of good standing, reputation, and ability in their respective lines. Any work done by sub-contractors who have not been approved as above will not be accepted.

This Contractor shall properly direct and control his sub-contractors, being responsible for the corelation of his own work and that of his sub-contractors. Should the Contract Documents assign certain responsibilities to sub-contractors the Contractor is not thereby relieved of such or any responsibilities for the entire work or any part thereof. The Contractor shall promptly transmit to his sub-contractors all drawings and specifications bearing on their work.

The Contractor shall submit in writing, with his bid, the names of all proposed sub-contractors, and the Engineer (or Architect) shall have the right to reject such as he deems unsatisfactory.

work to any other Contractors. Any work which the Contractors may claim to be an addition to the contract price will not be paid for as such unless an order therefor has been issued by the Owner.

Daily records of any extra labor and materials ordered by the Owner and for which the cost may not have been determined beforehand as described above, shall be rendered to the Owner during the execution of any such extra work, and if any work is done without such records, no payment for same will be approved by the Owner.

Specification No. 2 refers to the General Conditions of the General Contract, while Specification No. 3 briefly states that no extra work shall be done except upon a written order duly signed by the Commissioner of School Buildings.

Specification No. 4 also refers to the General Condition of the General Contract, while Specification No. 5 combines this item with that of checking the drawing dimensions, this being embodied in the following paragraph:

Figures and dimensions on all drawings shall be checked up by the Contractor who shall note any discrepancies and shall lay before the Superintendent all such as shall require attention. He will be held responsible for any errors not discovered before the work has been executed, but he shall not alter specifications, drawings or figures, nor make alterations in or additions to the quality, character or arrangements of the materials or work whether same shall involve additional expense or not, unless same shall be agreed upon first in writing, as provided for by the contract; this provision, however, shall not abridge in any way the Superintendent's rights as to the interpretation of the specifications, drawings and figures thereon.

MODIFICATIONS:

Specification No. 6 covers the matter of changes very well under the heading "Modifications" which reads as follows:

The right is reserved by the Owner to make changes by altering, adding to, or deducting from the work herein provided, when in the judgment of the Owner such are desirable, the contract sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract, except that any claim for extension of time caused thereby, shall be adjusted at the time of ordering such change.

No change shall be made unless in pursuance of the written order from the Owner signed or countersigned by the Engineer or a written order from the Engineer stating that the Owner has authorized the change, and no claim for an addition to the contract sum shall be valid, unless so ordered.

The value of any such changes shall be determined in one or more of the following ways:

A. By estimate and acceptance in a lump sum.
B. By unit prices named in the contract, or subsequently agreed upon.
C. By cost and percentage, or by cost and fixed price.
D. If none of the above methods is agreed upon, the Contractor, provided he received an order as above, shall proceed with the work, no appeal to arbitration being allowed from such order to proceed.

In cases "C" and "D" the contractor shall keep up and present in such form as the Engineer may direct, a correct amount of the net cost of labor and materials, together with vouchers. In any case, the Engineer shall certify to the amount, including a reasonable profit, due to the Contractor. Pending final determination of value, payments on account of changes shall be made on Engineer's certificate.

In addition to requiring proper workmanship and materials sub-contracts and sub-contractors must be controlled. It is a foregone conclusion that a contractor cannot absolve himself from the short-

comings of his sub-contractors; neither should the Owner, after employing a contractor of first-class reputation, be forced to accept sub-contractors who are not equally first-class and whose work is not fully up to the mark.

The paragraphs in GC-33 have been used for many years on a great deal of work, during which time they have proved to be quite satisfactory and to cover the ground in a very thorough manner.

The End

An explanation is due the readers of the articles on "Heating and Ventilating Specifications" regarding the references to "Specification No. 2."

"Specification No. 2" was one of those whose clauses were compared to the proposed "General Conditions" drawn up by the author. In several places, it was stated that "Specification No. 2" did not contain any reference to certain of the "General Conditions."

In fairness to the engineers submitting "Specification No. 2" it should be stated that, in addition to and supplementing "Specification No. 2," they issue a set of "General Conditions" which form a part of each specification prepared by their office.

These "General Conditions" which are referred to in the opening paragraph of "Specification No. 2" are the Standard Form of the American Institute of Architects, approved by all of the national associations engaged in the building industry. They contain 44 articles to which this firm has added 20 additional articles covering general clauses, which it is unnecessary to have typewritten every time a specification is made. The complete set of this firm's "General Conditions" is kept on file by contractors who estimate regularly on the firm's work.

In Mr. Alt's articles, there are several cases where it was stated that "Specification No. 2" had nothing to say on certain "General Conditions." This comment, however, does not apply, because many, if not all, of the points in question are covered in the firm's "General Conditions."

In bringing this matter to our attention, the firm submitting "Specification No. 2" writes:

"Our own criticism of many specifications issued for heating and ventilating work and other mechanical trades is that these consist of a large number of paragraphs, stating general conditions, among which are buried more or less vague and indefinite requirements relating to the heating and ventilating work itself, leaving the bidder to guess as to what he will be required to do. Our experience has convinced us that the separation of our specifications into two sections is conducive to clarity, and the favorable opinions of those who use our specifications seem to confirm our judgment."

Flexibility in Heating Systems

(*Continued from Page* 68)

degree of vacuum in the return line, or both are increased, the danger of "re-evaporation" also is increased.

In varying the temperature of the heating medium in the cases of air and hot water, control of the fire is all that is necessary, warm air, of course, being much more responsive than water. Regulation of individual warm-air outlets can be accomplished more or less satisfactorily by partly opening or closing louvres or dampers at the outlets. In cases where the warm-air system provides ventilation in addition to heat, any closing of the damper would effect a reduction in the fresh-air supply, which fact renders this method unsatisfactory.

Though the water heating system ranks high in flexibility, the individual heating element, the radiator, is by far the most rigid unit. Once hot, it remains hot for many minutes. In small residences equipped with water heating systems one frequently experiences overheated rooms. The common remedy in such cases is opening the windows, which method, as such, cannot be condemned; fresh air is always in order.

When the opening of the windows is not permissible, the quickest way of cooling the room is to *throw a blanket over the radiator*, arresting the circulation of air around and through the radiator.

No discussion of flexibility in heating would be complete without mentioning oil, gas and electricity. The fact that these sources of heat supply to the combustion chamber or heater surface can be entirely shut off or turned on full at will, either manually or automatically, without waste, makes them far superior to coal, wood, etc., where used in the steam boiler, water heater, or warm-air furnace. No matter how much a coal fire is checked or banked, it is impracticable to simulate the rapid cooling afforded by oil, gas, or electricity when *all* heat ceases to flow due to the closing of a valve or the throwing of a switch.

Electricity, as a source of heat for this purpose, stands high in point of economy of operation, ease of regulation, simplicity in installation, convenience and cleanliness. Gas and oil stand next in the order mentioned. In applying these fluid fuels to the individual heating elements within the rooms, provision should be made for expelling the products of combustion and replacing the oxygen and other necessary elements extracted from the rooms by the burning of the fuel. In the case of oil, complete gasification must be effected at the individual units.

The dollar-and-cents question which usually dominates all other considerations weighs heavily on the engineer's shoulders while he dreams of heating by electricity. The time, however, may not be so far off when water power will place within his reach this most flexible of all sources of heat.

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THOUGHTFUL executives in the heating industry are not at all satisfied with the way the rank and file of the engineers and contractors are meeting the new set-up brought about by modern merchandising methods in the general heating field and by the growing use, for house-heating purposes, of oil and gas. Reports, for instance, of poor business on the part of old-line heating contractors, coupled with complaints that the desirable jobs, in too many cases, are going to firms previously unheard of, may have a deeper significance than they imagine. These "interlopers" may be part of the influx of the merchandising type of contractor for which admittedly there is such a need.

Those who are close to the situation express it this way: Contractors, as a class, have fought their way up from what formerly was recognized very frankly as a trade. They were skilled workmen, whose services were available to those in need of them. For years they were accustomed to wait for calls from prospective customers, and when the call did come, they were answered at the convenience, not of the customer, but of the contractor.

As the industry grew in importance the contractor attained a corresponding status, but never for a moment did he consider a basic change in his methods of doing business. The reflection of his limited vision and of his incomplete preparation for his calling is to be seen in the curious examples of incorrect design and installation which come to light when an old building is torn down, or a heating plant remodeled.

To be sure, this condition of things represents the "old days," but all the progress made since that time has been confined almost entirely to improved workmanship, rather than to better business methods. The idea continued to persist that the heating contractor was a tradesman in the narrow sense of that word. Then the merchandising era "broke," and, almost simultaneously, oil and gas for house heating got under way on a large scale. But the heating contractors were not ready for the new dispensation. All of us can recall distinctly how cold a response they made to the new developments and how firmly they held out for the old-established methods. Their attitude was widely interpreted to mean that if any change was to be expected, it must come through them. As a matter of fact, it is nearer the truth to say that the groove they had been following was worn so deep and had existed so long as to make it extremely difficult for them to change their mental attitude towards the business trend. In short, their ways had become pretty firmly fixed.

AS one instance of the steps that have been taken to enlarge the field of the heating contractor, we have only to cite the plan for dealer cooperation adopted by the Consolidated Gas Company of New York. Since May 1 this company has had a division devoting most of its time to selecting and calling upon heating contractors, encouraging them to display, among other products, house-heating and domestic water-heating boilers. This equipment is consigned to them and the company offers to carry their accounts, at the same time placing at their disposal all of its engineering and sales forces. Most significant of all is the plan for the payment of commission to contractors on the equipment sold. In the case of boilers, for instance, the contractor receives a commission of 20%, whether or not he has had any part in effecting the sale. Where he has influenced the sale, his commission amounts to 20% plus 5%. This is handled on the books of the gas company by billing the contractor, in one case at a discount of 20% and, in the other, at 20% and 5%.

IT is very evident that we have reached a crucial point in the evolution of heating contracting. Of course, on the important work, involving a combination of engineering and contracting, the present line-up undoubtedly will continue, but in the broad field of house heating, involving not only new installations, but so large a percentage of replacement work, a new set-up appears to be inevitable. The present old-line heating contractors will find their line of advance will depend upon their adoption of up-to-date merchandising methods and in extending their activities to the oil- and gas-heating fields, while the oil- and gas-heating men will win a permanent place for themselves in the heating industry by acquiring the necessary knowledge of the practice, as well as the art, of heating.

House Heating Featured at Atlantic City Convention

The High Spots Were Conversion Equipment, Sales Cooperation with Heating Contractors, Proper Installation and Servicing, and Gas Consumption Data

HOUSE heating in the form of straight gas-fired equipment, gas conversion units and automatic control devices, was a key-note at the tenth annual convention of the American Gas Association, at Atlantic City, October 8-12. Of 453 exhibits, 32 were directly concerned with house heating. Thursday afternoon, October 12, the house-heating symposium was held, at which time fuel consumption, fuel costs and servicing of house-heating boilers and furnaces, and gas conversion equipment were discussed.

At the symposium A. J. Peters, of the Consolidated Gas Company of New York, gave a forceful talk in which he told of the work being done by the Consolidated Gas Company in getting heating and plumbing contractors to cooperate with the gas companies in the sale of gas-fired equipment and appliances. A commission is given to the dealer on the sale of all appliances and everything possible is done to keep the heating contractor in friendly accord with the policies of the gas company. Mr. Peters brought out that it was not only possible to cooperate with dealers, but that the results they were obtaining exceeded expectations. It is significant that the gas companies are not attempting to take over the functions of the heating contractors, but are attempting to work with them.

F. M. Rosenkrans of The Gas Service Co., Kansas City, Mo., said that gas house-heating is making great strides in his district and that the revenue from house heating is many times that obtained from domestic appliances. He went on to say that concerted efforts are necessary in the gas industry to combat the use of oil and coal for house heating. The coal interests are attempting to make coal more attractive, not only by putting home-owners' heating systems into shape, but they also are promoting the sale of stokers. Oil dealers will dump oil in one-half hour, day or night, and guarantee not to mutilate the owners' grounds or disturb them. Among the obstacles to the sale of gas for house heating is the general reluctance in the gas industry to lowering the rate schedules, and, furthermore, the sales efforts so far have been too technical and not enough attempt has been made to sell the owner on the idea of comfort and convenience. The Gas Service Company has made 7500 house-heating installations in the last three years. The first 500 were on trial and very few of them were taken out.

Price The Prime Factor in Selling Conversions

Speaking of regularly-designed gas-fired equipment as opposed to conversion equipment, Mr. Rosenkrans brought out that the ideal installation is a gas-designed one. The greatest value of a conversion system lies in the price consideration. It is hard to get a coal-fired plant owner to change his boiler, due to the great cost, and when such a case is encountered, the conversion unit will act as an entering wedge to sell a regular gas installation later; this company has sold hundreds this way. However, 85% of all the installation sold so far by this company were conversion installations, and many owners of these are now buying gas-designed equipment. The policy of this company has been to place all work on sheet metal, steam-fitting, and wiring with outside contractors, gas-fitting only being done by gas-company employees. The average cost on their installation shows that the sheet metal work costs from $75 to $100 per installation for furnaces and the steam-fitting for all types of boilers averages $175 per installation. Servicing costs $1.50 annually per customer for house heating. It has been found that the average size of the installation is decreasing, showing that this company is reaching a class of people with lower incomes than those heretofore reached. The average cost when using gas for house heating in this district is from 22% to 25% over that of the cost when burning coal.

"Conversion installations are of lower initial cost and their greatest value in house heating activities is their price consideration to customers. The homes of this country now are furnished with coal-designed equipment, and in the aggregate, represent a tremendous investment. The selling of the gas-designed house heating plant to replace this coal-designed equipment represents one of the big obstacles which is encountered in the securing of maximum results in promotion of gas house-heating at minimum expense. Through conversions the customer can be reached who is unwilling or unable to make a large investment in gas-designed apparatus and dispense with a good coal furnace.

"It has been our experience that the entering wedge in securing a large amount of house-heating business has been through the use of automatic gas conversions. Customers can learn first hand with a comparatively small investment the advantages of automatic gas house-heating and at the same time utilize the present investment he has in a good coal furnace. I believe our success in selling house heating is primarily due to the fact that we have featured automatic gas conversions and hundreds of sales have been secured where it would have been impossible to even arouse the customer's primary interest in gas-designed plants.

"In one comparatively small artificial gas company, with which the writer is familiar, they have been very successful in promoting the house-heating load through the use of automatic gas conversions. Out of approximately 260 installations, which have been attached during the past three years, approxi-

mately 85% have been conversions. It is through the use of conversions that this large amount of house heating has quickly been attached."

G. E. Whitwell, of the Equitable Gas Co., Pittsburgh, said that in his district where natural gas is used, with a heating value of 1100 B.T.U. per cu. ft., 90% of the installations are conversion units. The house-heating division in this company was started in January, 1927. Before that time, gas house-heating was discouraged. The policy of this company is to do no installation work, but to let all installation work out to contractors who are paid 15% commission on the retail price of the equipment, and 25% if the contractor aided in the sale. The gas company carries the paper, buys the equipment and makes the sale, consequently the dealers are perfectly willing to cooperate with the gas company. They have found that the total cost, including all installation charges, commissions, radiators, etc., of a steam heating system averages $2.25 per sq. ft., water heating systems averaging $2 per sq. ft. Warm-air installation averages $1 per sq. in. of leader pipe in new houses and $1.50 per sq. in. of leader pipe in old houses. It has been found in Pittsburgh that in 60% of the homes the radiation had been figured too low and the heating system, consequently, had been inadequate. It is up to the gas company to put the heating system in shape.

Mr. Whitwell showed graphs which indicated that the gas consumption follows the temperature curve very closely. Fuel consumption is, however, somewhat affected by wind velocity and other secondary factors.

Two principal service calls are made on house-heating installations in this district. The first is when starting the heating plant; when lighting the boiler for the first time, the customer is called in so that he can see how easy it is and, consequently, can feel more familiar with the installation.

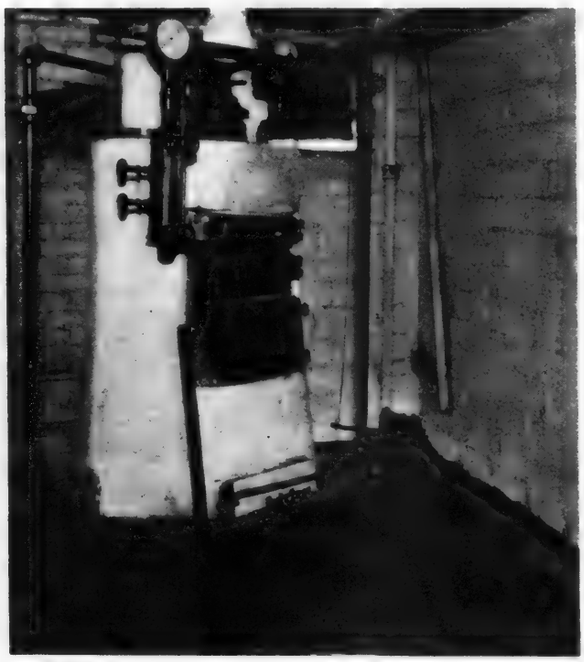
The second type of service call is for explaining the functioning of the controls and their adjustment. This company has found that most of its service calls are due to home-owners tampering with the controls. Owners also fail to flush the heating system, so that this company flushes vapor systems for the owner. The service calls on vapor systems have averaged $12.64 per year, due to this reason.

Service Calls Costly

The Equitable Gas Company, has found that it is good policy not to give an estimate on gas consumption for non-automatic gas-fired boilers or furnaces and does everything possible to have the owner install automatic control. Thermostatic and limit controls are used on 95% of these installations.

With bituminous coal selling at an average of $6.75 per ton, the average amount used being 1¾ to 2 tons per room per season, a six-room house will require $80 worth of coal per heating season, while with gas the cost runs from $105 to $115 per season per room, or 35% higher than the cost of the coal. However, this company has found that the homes are better heated with gas and this makes a theoretical comparison of fuels unfair.

W. B. Clemmitt, of the Baltimore Consolidated Gas Co., Baltimore, described house heating in Baltimore, which was started in 1916, with a rate of 35c per 1000 cu. ft. At the present time they have an 85c primary rate and a 65c secondary rate. Each house is figured separately and is given a specific differential, depending on the number of rooms and other variables. At the present time this company has 932 water boilers of the regularly designed gas type, and 26 conversion units in water boilers, 690 gas-fired steam boilers and 42 converted steam boilers, 85 warm-air installations and 8 warm-air conversion installations. This company does no layout or installation work, this being left to the contractors. Heating contractors get a commission of 20% on the sale of all boilers. The gas company is ready at all times, not only to service boilers sold by it but will further offer engineering advice to owners of boilers which the gas company has not installed or sold. New jobs are inspected once in heating season and all installations are inspected once during the summer. Cost sheets showing the monthly cost of the gas for heating homes is sent to every home-owner so that he knows at all times just what gas house-heating is costing him, and the company has found that the home-owners appreciate this service. The average cost per square foot of steam radiation per season is 63.2 cents for installations up to 200 sq. ft.; 61 cents for systems over 200



Courtesy Architectural Forum

Boiler Originally Using Coal Now Converted for the Burning of Gas

Courtesy Architectural Forum

Large Gas-Fired Boiler Installation Using Two Boilers for Flexibility

Courtesy Architectural Forum

Gas-Fired Warm-Air Furnace Showing a Type Frequently Installed on the Pacific Coast

Courtesy Architectural Forum

Coal-Fired Warm-Air Furnace with "Conversion" Installed

sq. ft.; 57.4 cents for plants over 500 sq. ft., and 51.3 cents for those over 1000 sq. ft.

On hot water radiation the cost for systems in the neighborhood of 500 sq. ft. is 39.2 cents per sq. ft. For systems between 500 and 1000 sq. ft., 39.4 cents per sq. ft., and for systems over 1000 sq. ft., 35.9 cents. As an average, in this city, one ton of anthracite may be said to equal 3400 cu. ft. of gas. On systems less than 500 sq. ft., and figuring the life of an oil burner at ten years and using 10-cent oil, gas costs less than oil, taking into account the fixed charges on the oil burner. The average consumption in steam installations in this district is 0.1898 cu. ft. of gas per sq. ft. of radiation per degree-day.

P. A. Nelles, of the Malden and Melrose Gas Light Co., Malden, Mass., stated that it was the policy of this company to give a 20% commission to the heating contractor regardless of whether or not he had aided in the sale. The gas company carries the paper. House heating has had a normal and healthy growth with this company and many installations are sold to families having less than $5000 per year income. Mr. Nelles stated he had found that there was no saving by using a clock thermostat and, furthermore, there was no saving in gas by setting back the thermostat at night. Too, the clock thermostat causes many service calls and the company has decided against their use.

In regard to servicing, it has been found that one service man can take care of 50 heaters and do a great deal of other work besides. Burners, they have found, need cleaning at least every three months on steam and water jobs. The average gas consumption with this company has been found to be 1330 cu. ft. per sq. ft. per year with steam systems, 1200 cu. ft. for water systems and 1200 cu. ft. for warm-air systems, *when the figures for all other systems are converted into equivalent square feet of steam radiation.* There are from 6100 to 6200 degree-days in this locality. They have further found that although the efficiency of various gas-fired appliances are the same on the test-floor, in actual installation the gas consumption differs as much as 10% in some cases, which seems to indicate that the seasonal efficiency of all these appliances is not the same.

In the city of Malden with 90-cent gas of 530 B.T.U. heating value, and $16.50 per ton coal, it has been found that gas costs from 50% to 100% more than coal for house-heating, while oil costs about the same as coal. They have found a high mortality in oil burners.

B. H. Long, of the Kompak Co., New Brunswick, N. J., said that oil men have sold the idea of comfort and convenience and have awakened the gas men to the possibilities of automatic heating. This speaker, too, said that the clock thermostat had many disadvantages, and claims that the clock thermostat is a barnacle on the gas industry and was inherited from the coal-burning equipment dealers. He advocated the system of keeping the fire-pot warm by the use of a simmer burner, and not having the large burner go on and off at such frequent intervals.

A. L. Klees, of the Combustion Utilities Corp., New York, said that his company considered conversion units as a stepping stone to acquiring the house-heating load and that the conversion unit should be used by the gas companies to sell the idea of gas heating, and later the gas companies could convert the home-owners to the use of a regularly designed gas-fired unit. He stated that conversion installations cost on an average of $25 each, where from 100 to 200 are installed per year, but if over 1000 are installed per year the average cost per year would be only $15. This speaker said that the clock thermostat affected the daily load curve, causing an early morning peak. Conversion servicing should involve little cost and should average from $5 to $15 per year. Fuel consumption with a conversion unit, this speaker claimed, showed that there is no great difference in operating cost between regularly designed gas-fired equipment and a well-designed conversion unit, and that the difference in fuel cost is not a major factor. The efficiency of these units reaches 70%, against 55% with oil; the efficiency when burning anthracite is 50%, and when using bituminous coal the efficiency would be from 35% to 40%.

Thomson King, of the Peerless Heater Co., Boyertown, Pa., and chairman of the house-heating committee, said that while the use of conversion equipment was sound practice in many manual-gas fields, it might not prove to be so in

some manufactured gas territories. In contrast to the statement made by some conversion manufacturers that the efficiencies they had obtained were higher than with regularly designed gas-fired equipment, Mr. King said that if the efficiency of the conversion equipment were higher, the manufacturers of gas-fired equipment would change their equipment and possibly adopt conversion equipment. He also said that the question of pushing the sale of conversion equipment must be considered very seriously.

Operating Efficiency Analysis Favorable to Conversion Units

Harold Almert, of the Columbia Engineering and Managing Corp., New York, said that, in the past, conversion equipment was lamentably bad, but that it now compared favorably with gas-fired equipment and that conversion systems are necessary to bring down the price resistance to regularly designed gas-fired equipment. He said that the relative efficiencies of the two was 79% and 73%, the better result being obtained with the boiler designed for gas fuel. Mr. Almert said that he had gone into the calculations involving fixed charges and gas consumption on the two classes of equipment and found that, in the average case, if the fixed charges are considered, the owner is about 7% to 8% better off if he buys conversion equipment. He also said that there was a great sales resistance by people who buy gas-fired equipment because the buyer wondered if he would get proper service on the equipment, and since the appliances are so expensive, they hesitated to make the investment. In such cases, Mr. Almert said that it would be wise to sell conversion units and later the conversion could be taken out and gas-fired equipment sold to those owners. The symposium closed with a heated discussion as to whether the efficiency is claimed by a conversion manufacturer were possible or not.

Among the exhibits were those of the American Gas Products Corp., New York, showing gas-fired boilers; the Automatic Gas-Steam Radiator Co., Pittsburgh, showing gas-fired radiators; the B-Line Boiler Co., Cleveland, O., with a line of boilers; the Bryant Heater and Mfg. Co., Cleveland, featuring Bryant heaters; the Carrier Lyle Corp., New York, showing its new Weathermaker. The Cleveland Gas Burner & Appliance Co., Cleveland, showed a full line of burners for conversion work; Columbus Heating and Ventilating Co., Columbus, O., showed gas-fired furnaces, and the Collier Gas Heating Co., Lynn, Mass., had an exhibit of automatic conversion equipment together with an economizer, which was used in connection with its conversion equipment. The Hot-Kold furnace was shown by the General Iron Works of Cincinnati. Hoffman Specialty Co., New York, showed its basement and radiator specialties; the Humphrey Co., Kalamazoo, Mich., had an exhibit featuring a new high-capacity gas-fired unit heater.

A conversion unit was shown by the Ironton Stove & Mfg. Co., Ironton, O., and the Johns-Manville Corp., New York, featured insulation in connection with heating systems. The Kompak gas conversion burner was shown by the Kompak Co., New Brunswick, N. J. Thermostatic and automatic control equipment were shown by the Minneapolis Regulator Co., Minneapolis, Spencer Thermostat Co., Cambridge, Mass., and the Time-O-Stat Corp., Milwaukee. Gas-fired furnaces were exhibited by the L. J. Mueller Co., Milwaukee, and the Payne Furnace and Supply Co., Beverly Hills, Cal. Gas-fired furnaces and conversions were exhibited by the Wise Furnace Co., Akron, Ohio. The Thatcher Co., Newark, N. J., also showed gas-fired furnaces, and the new Pittsburgh-Gallaher gas-fired boiler was featured by the Pittsburgh Water Heater Co., Pitsburgh. The Peerless Heater Co., Boyertown, Pa., showed a gas-fired boiler; conversion equipment was exhibited by the Roberts Gas Burner Corp., Buffalo, and the Sweet & Doyle Foundry and Machine Co., Troy, N. Y. The Robertshaw Thermostat Co., Youngwood, Pa., showed a full line of automatic controls, and the Scientific Heater Co., Cleveland, O., showed an economizer to be used in connection with conversion equipment. Conversion equipment was featured by the Weatherbee-Gunn Co., Evanston, Ill.

It is particularly significant to note that at this convention of the American Gas Association, there were exhibits of ten conversion equipment manufacturers, while at last year's convention there were only a few. In spite of the fact that the American Gas Association's testing laboratory will not approve conversion units, except for a particular size and type of boiler and not in general, conversion manufacturers do not seem to be disturbed, but, on the other hand, seem to be entering into this field with great zest.

This convention was the largest, not only in attendance, but also in the number of exhibits, ever held by the association, and reflects the great interest and enthusiasm being taken by the gas companies in the various phases of their activities.

Report of Subcommittee on Converted Installations

By E. F. Koch

Peoples Natural Gas Co., Pittsburgh, Pa.

THE heating of homes and buildings by means of gas burners placed in boilers and furnaces designed to burn coal has been common practice in natural gas territory for twenty years and more. In manufactured territory it has been practiced to a much smaller extent, notably in Baltimore in 1916 and 1917, and intermittently in other cities.

In natural gas territory a very great number of such installations are in operation, but very little data has been collected on which estimates of consumption, demand or efficiency can be based. The collection of such data should be undertaken and would, if properly carried out, throw a great deal of light on the subject.

In natural gas territory in the past, gas rates have been so low that efficiency was not relatively very important. Since natural gas rates have increased to their present levels, efficiency has assumed much greater importance, and the ratio of converted to gas designed installations has decreased very considerably.

Also, in the past, the fact that there often existed a serious danger of gas shortage and low pressure in cold weather prevented the installation of the more costly gas-designed appliance and encouraged the use of burners which cost very little and could quickly be removed if the customer wished to return to the use of coal.

The stabilizing of the gas supply and the restoration of confidence has helped to increase the sale of gas-designed units.

In manufactured gas territory neither the conditions of excessively cheap gas nor the uncertain supply has existed and the number of converted installations has been quite small. On the whole, up to the present time, what experience there is has been unfavorable to the principle of conversion, but this has been caused to some extent by the lack of engineering and chemical supervision of such installations. At the present time a good many conversion installations are being made in manufactured gas territory with more atten-

tion paid to these features, and by next year there should be a large amount of reliable data available on their performance.

In considering the subject, it must be clearly realized that the efficiency of any job depends not only upon the burner used, but upon the boiler or the furnace into which it is inserted. The burner may be perfect from a combustion standpoint, but if it is installed in a boiler which is undersized for the job or deficient in heat absorbing surface, the economy of operation cannot be satisfactory. Since there is an almost infinite number of sizes and shapes of coal boilers in use and the conditions of draft and flue travel very widely, it is very difficult to collect or present reliable and accurate data on the comparative efficiencies of converted and gas-designed installations.

Straight Gas Appliances Usually More Efficient than Conversions

In general it may be said that the gas designed appliance is a good deal more efficient than the converted installation unless the latter is made with great care and given individual engineering attention. Instances can be cited to prove increases in efficiency up to 50%, where burners in a coal boiler were replaced by a gas-designed boiler, but we have not enough data available to establish an average figure, nor have we data on the performance of some of the later models of conversion units. Undoubtedly there is some point depending upon the cost of the heat in the gas where burners of low first cost and higher operating cost may prove as economical, all things considered, as a gas-designed appliance or higher first cost and low operating cost. That point is, of course, where the excess of the fixed charges on the gas-designed installation over the conversion is equal to the value of the gas saved by the former.

Thus, if a gas-designed installation cost $600 and a conversion cost $200, and we assume interest and depreciation at 11% on each and a consumption of 400,000 cu. ft. per season with a saving of 20% in favor of the gas designed job, and call the price of gas at which the value of the gas saved just equals the excess of fixed costs, then the annual saving in gas effected by the gas-designed job is 20% of 400,000 or 80,000 cu. ft., and the excess of annual fixed costs of the gas-designed job over the conversion is 11% of ($600—$200) or $44, and we have:

$80X = \$44$; therefore $X = 55$ cents per M. Therefore, above 55 cents per M the gas-designed job is most economical; and below this price, the conversion.

In view of the lack of data on operation costs, we must endeavor to propose and to some extent answer in a very general way the questions that seem most important in a broad consideration of our subject, bearing in mind that the final question to which we want the answer is: What should be the attitude of the gas company toward converted jobs?

Questions and Answers on Conversion Problems

Question 1: Is a company ever justified in selling a converted installation? If so, under what conditions and at what price of gas?

Answer: Gas companies are justified in selling converted installations.

(a) Where the layout is checked and planned by a gas company engineer in accordance with the rules set down by the individual company.

(b) It will be desirable on most conversion jobs from a gas company's point of view to have a chemist take flue gas samples and analyze them under various conditions and pressures to insure safety from the presence of carbon monoxide, and to secure efficiency.

(c) The price of gas will have a considerable bearing on the number of installations of conversion jobs. It is the general opinion that, where the price of gas exceeds $1 per 1000 cu. ft. for natural gas, converted jobs will be in the minority and should not be recommended.

Question 2: What should be the attitude of gas companies toward conversions made by outside interests?

Answer: This question is one which requires very strict cooperation with any one installing conversion equipment, and, owing to the expense of securing this cooperation, it makes it more desirable to stick to straight gas equipment.

Question 3: How shall gas company policy be established?

Answer: This policy must be based upon consideration of the future as well as the present, and upon the answer to the following questions:

Question 4: First cost of conversion compared with gas-designed boilers and furnaces?

Answer: Conversion burners will have lower first cost than gas-designed boilers. However, with the addition of numerous safety devices, engineering supervision and flue gas analyses, the cost of these conversion systems are sometimes very close to the cost of the straight gas-designed boiler or furnace.

Question 5: Comparative operation costs involving consideration of effect on demand and consumption, fixed charges, repairs and maintenance?

Answer: We have been unable to get any reliable and comprehensive data on this question.

Question 6: Comparative safety?

Answer: There is no question but that the straight gas-designed boiler is by all odds the safest equipment. However, by strict supervision on the gas company's part of all conversion jobs, they can be made very nearly as safe.

Question 7: Is A.G.A. Laboratory supervision and approval possible?

Answer: No. Due to the number of conversion burners that are at present on the market, and the added number of the future, it readily can be seen that unless every conversion burner was installed on every type of coal and oil-fired boiler, it would be impossible to get the approval of the American Gas Association. While the fundamental principle of the conversion burner may be gone into and approved, the operating safety and efficiency will depend upon the construction of the boiler or furnace in which it is installed and the manner of installation, and these cannot very well be subjected to the tests or supervision of the laboratory.

Question 8: Is motor blast desirable or undesirable on the converted job?

Answer: It is undesirable, for the reason that a motor burning out, or current cut-off, would create considerable trouble and necessitate the shutting down of the burners, and in that way the consumer would be without heat, while the gain in efficiency due to blast is apparently not very large.

Question 9: Comparative cost of service to the gas company?

Answer: The comparative cost of service required on conversion installations will be considerably higher than on gas-designed equipment.

Question 10: The effect on public opinion?

Answer: Careless installations of conversion burners do much to affect house heating by gas, and, where the installation is not properly made, will do many times more harm than good.

Straight Gas-Designed Equipment Favored

Summary: The general thought on the conversion burners as a whole against straight gas-designed equipment is strongly in favor of a straight gas-designed boiler or furnace. While their first cost is generally higher than the conversion job, they are so well designed, both from mechanical and safety standpoints, and their efficiency is so high, that it is the committee's opinion that this equipment is much to be preferred over any conversion system. However, there are some instances where conversion equipment has a field; but these cases are in the minority and are greatly outweighed by the factors which the straight gas equipment has in its favor.

Report of Subcommittee on Large Building Heating

D. S. Reynolds, of the Boston Consolidated Gas Company, chairman of the committee, presented his report, excerpts of which follow:

This report should be considered in connection with that for last year, as this is simply an effort to carry forward the work done then.

The best way to compare installations is on the basis of the cubic feet of gas used per square foot of radiation per degree-day. If this value be called "K," the gas consumption for the heating season in any locality may be estimated by multiplying the theoretical square feet of radiation by "K" and this product by the number of degree-days.

A table is appended showing the data on several large installations, and "K" is worked out for each case.

A summary is shown with the average "K" for steam, vacuum vapor and hot water.

With regard to the percentages to be added to theoretical radiation to obtain the boiler rating, there seems to be no definite or average policy. In steam installations this percentage varies from 3% to 120%, in vacuum vapor from 18.5% to 126%, and in hot water from 27% to 120%.

The boilers used in large building heating may be controlled in various ways.

A control made by the New York Steam Corporation is desirable in many instances. This system consists of a master clock and series of timing switches which are installed in the boiler room. These switches operate a Minneapolis motor which in turn opens or closes a balanced valve in the main steam supply, thereby shutting the boiler or boilers down by steam pressure; or it may open or close the gas valves.

This service control provides an intermittent supply of steam to the radiation either throughout the 24 hrs. of the day or during the daytime hours only. The setting of the day switch may provide no service, continuous service, or provide five intermittent settings, such that during each period of 90 min. steam will be supplied in increments of 15 minutes for each successive setting of the switch, with the steam shut off during the balance of the 90-min. period. These settings afford 16%, 33%, 50%, 66% and 83% of that maximum heating effect that is required only on days of zero temperature.

Such a control provides control of the valves supplying the heating system and does away with necessity of manual operation of valves in the basement. The adjustment of switches by the operator will provide a suitable amount of heat during the daytime and automatically shut off the steam at night and turn the same on again in the morning at the hours for which the night switch is set. It also will provide morning service until 9 A.M. with an automatic return to intermittent service thereafter, if the operator so desires.

Where this control is used to shut off the gas supplies to a number of boilers

PUBLIC AND SEMI-PUBLIC BUILDINGS

MODULATED STEAM

No. of Installations	*Radiation Smallest*	*Radiation Largest*	*Average*	*Average "K"*	*Remarks*
9	1014	12930	5398	0.162	Small and medium-sized office buildings
1	——		33789	0.175	Large office buildings
3	1441	2580	1868	0.212	Hospitals
5	1200	10803	4427	0.080	Churches and Masonic Temple
2	3834	13262	8548	0.099	Public schools
10	1051	3995	2375	0.213	Stores, bank and factory
1	——	——	1699	0.138	Garage

Note: Indirect and partial indirect installations are averaged with direct jobs as the "K" appears to run about the same based on the theoretical radiation, which is taken as the hourly B.T.U. heat loss for 70° F. temperature difference divided by 240 for steam and 150 for hot water.

STEAM

MANUFACTURED GAS

Heat Value of Gas	*Inst. Rad.*	*D. C. I. Theor. Rad.*	*Gas Cons. cu. ft.*	*D. D.*	*K**	*Type of Bldg.*
540		1,014	818,800	5,723	0.141	Office
535	489 Dir.	1,036	1,291,000	6,012	0.207	Residence
535	650 Ind.					
535	1,047 Dir.	1,051	1,051,900	4,971	0.202	Bank
535	124 Ind.					
——	1,060	——	1,187,000	——	0.181	Residence
	1,075	——	1,208,000	——	0.182	2 Apt.
	1,110	——	1,048,000	——	0.152	2 Apt.
——	1,200	——	576,000	——	0.078	3 Apt.
535	1,320	1,320	1,236,100	——	0.199	Residence
550	1,642	1,345	1,649,800	7,264	0.169	Office
——	1,441	——	2,148,000	——	0.240	Hospital
535	1,560	1,509	1,320,600	——	0.198	Residence
535	——	1,533	279,300	——	0.078	Pool Room
——	1,582	1,579	2,184,000	8,368	0.165	Hospital
——	——	1,585	437,000	2,620	0.105	Theatre
——	1,600	——	1,970,000	——	0.198	Residence
——	1,620	——	2,820,000	——	0.280	Store
——	——	1,648	1,136,000	6,187	0.111	Stores
535	1,699	——	1,403,600	6,000	0.138	Garage
535	2,341	1,793	684,000	——	0.102	Church
535	1,668	1,808	1,324,800	——	0.138	Office
535	1,857	2,124	1,556,900	3,354	0.218	Store
——	1,947	——	1,840,000	——	0.152	Ware Houses
535	2,130	2,450	2,394,400	4,027	0.243	Store & Res.
——	2,350	——	3.330,000	——	0.228	Factory
540	2,558	——	3,694,000	4,510	0.320	Theatre
540	2,580	——	2,250,700	3,788	0.230	Hospital
——	2,606	2,646	1,669,000	3,232	0.195	Store & Frat. House
530	2,067	2,810	2,153,500	7,740	0.099	Office
——	2,680	2,860	2,715,000	6,300	0.151	Store
	3,000	——	3,100,000	——	0.166	Residence
——	3,834	——	2,294,000	——	0.096	School
——	5,100	——	2,200,000	——	0.069	Church
535	6,511	7,000	5,559,500	——	0.167	Office
545	12,300	——	9,182,800	4,748	0.157	Office
——	12,930	——	7,472,400	3,673	0.155	Office
——	13,262	——	3,727,000	2,747	0.102	School

*"K" is the gas consumption in cu. ft. per sq. ft. of radiation per degree day. Theoretical radiation is used when available.

HOT WATER
MANUFACTURED GAS

Heat Value of Gas	Inst. Rad.	D. C. I. Theor. Rad.	Gas Cons. cu. ft.	D. D.	K	Type of Bldg.
——	1,600	——	1,068,000	——	0.108	Residence
540	Part. Ind.	1,640	795,800	4,510	0.108	Residence
540	1,680	——	1,079,700	4,531	0.141	Office
540	2,200	1,700	1,531,500	9,001	0.100	Residence
——	1,714	——	1,080,000	——	0.101	Residence
——	1,743	——	1,060,000	——	0.098	Residence
540	1,874	——	2,090,400	10,074	0.111	Residence
——	2,000	——	970,000	——	0.078	Residence
540	Part. Ind.	2,006	826,600	4,571	0.090	Residence
——	2,027	——	1,300,000	——	0.103	Residence
——	2,100	——	1,427,000	——	0.109	Residence
535	2,200	——	1,816,800	6,007	0.138	Residence
540	2,200	——	926,800	4,571	0.092	Residence
——	2,400	——	1,570,000	——	0.105	Residence
——	2,435	——	2,270,000	——	0.150	Residence
535	2,500	——	1,835,200	6,007	0.122	Residence
550	2,600	——	1,103,200	6,804	0.062	Residence
——	2,800	——	1,450,000	——	0.083	Residence
535	3,290	2,825	1,623,500	5,905	0.097	Residence
540	——	3,090	1,834,800	5,636	0.105	Mill
535	4,594	——	3,310,800	6,007	0.120	Residence

used for a heating installation, the simultaneous turning on and off of all boilers creates a sudden drain with an attendant drop in pressure or a building up of pressure due to the gas velocity. The sudden pressure drop, if large enough, may be sufficient to cause the burners to flash back.

Principle of Operation

The manually set dials will automatically cause the solenoid valves to simultaneously open and close according to the required time intervals. A chart accompanying the control materially will aid in setting the dials. The electric current opens the valve and allows the gas pressure on the top of the diaphragm to be relieved through the escapement pilots, which in turn allows the gas to pass to the burners. The different size escapement orifices vary the time required for the gas to escape sufficiently to allow the diaphragm to lift. Hence the boilers start to operate, one after the other.

Safety Feature

Should the electric supply, the control or the solenoid valve fail, a spring in the valve will close it, turning off the boilers, thus preventing waste and overheating.

Another method that has successfully been used in many instances where the piping is laid in such a manner as to permit it, is to control each part of the building by a balanced valve in the steam supply. The balanced valves are closed or opened by electric motors which are controlled by Honeywell or Minneapolis room thermostats. As soon as a thermostat controlling a room, store or portion of a building is satisfied, it operates the motor which closes the balanced valves and makes an electrical contact. As each additional thermostat is satisfied the corresponding balanced valves are closed and electrical contacts made. When all thermostats are satisfied, all the valves are closed and all electrical contacts made; this closes the circuit and a motor located at the boiler or boilers closes the gas valve or valves. If any thermostat now calls for heat it operates its motor to open the balanced valve; this breaks the electrical circuit and the boiler or boilers are started up at once.

This method has been used with from two to ten thermostats.

If used on a one-pipe steam system, care must be taken to locate the balanced valves on the radiator side of the wet returns.

In making an installation of gas-fired boilers for a large building, particular attention must be paid to all the details found necessary in residence heating, and great stress should be laid on checking and reducing the draft where tall chimneys are encountered. An excessive draft means a greatly increased gas bill.

San Francisco to Get Natural Gas

Recent negotiations closed by the Mexican Seaboard Oil Company with the Pacific Gas and Electric Company provide that the latter company will build a 240-mile pipe line from the Mexican Seaboard's gas properties, at Buttonwillow field, to San Francisco. This pipe line is to supply natural gas to San Francisco, Oakland, and neighboring cities, from the Mexican Seaboard Oil Company's seven gas wells. The estimated potential production of natural gas from these properties is several hundred million cubic feet per day.

Under the law the contract to build this new pipe line is subject to approval by the California Railroad Commission.

New Installation Rules Published for Gas-Fired Heaters

At the 1928 meeting of the National Fire Protection Association the committee on gases recommended regulations for the installation, maintenance and operation of house-heating equipment. The rules tentatively adopted were:

1. These regulations are intended for application only to low-pressure heating systems. Such systems shall be defined as those wherein the pressure does not exceed 15 lbs.

2. No gas-fired boilers or furnaces for heating a building or buildings shall be installed and no boiler or furnace now installed shall be supplied with gas fuel unless the following regulations are complied with:

3. A thermostatic pilot light shall be used, so constructed and adjusted that no gas can flow through the main burner unless the pilot light is burning. The operation of the safety device shall not depend on the closing of an electric circuit to shut off the main gas supply.

4. The boiler or furnace shall be equipped with safety devices arranged to shut off the main burners in case of high steam pressure or low water (or high temperature) for steam or vacuum vapor boilers, or high air temperatures for warm-air furnaces. A steam or vacuum vapor boiler equipped with a high temperature limiting device need not be equipped with high pressure or low water cut-off. These devices shall not depend upon the closing of an electric circuit to shut off the main gas supply. This section shall not be understood to prohibit the use of electrical regulating devices provided safety devices meeting the above requirements also are installed.

5. An approved gas pressure regulator of sufficient size shall be installed in the gas line leading to the appliance.

6. All boilers or furnaces shall be connected to flue. The size of the flue and flue pipe shall be proportionate to the maximum rate of gas consumption. not less than 10 sq. in. in cross sectional area for each 50,000 B.T.U. of gas used per hour. All flue pipes shall be provided with a draft break or down draft diverter of an approved type which shall have a cross sectional area at least equal to that of the flue pipe. No gas valve shall be installed in the flue pipe unless so arranged that the main gas valve will not open until the damper has opened, and the damper will not close until the main gas valve has closed, in which case the damper and draft break shall be so located and proportioned that they will not cause the formation of carbon monoxide even if the damper is closed while the gas is burning.

These rules, it is anticipated, will finally be approved at the 1929 meeting of the association.

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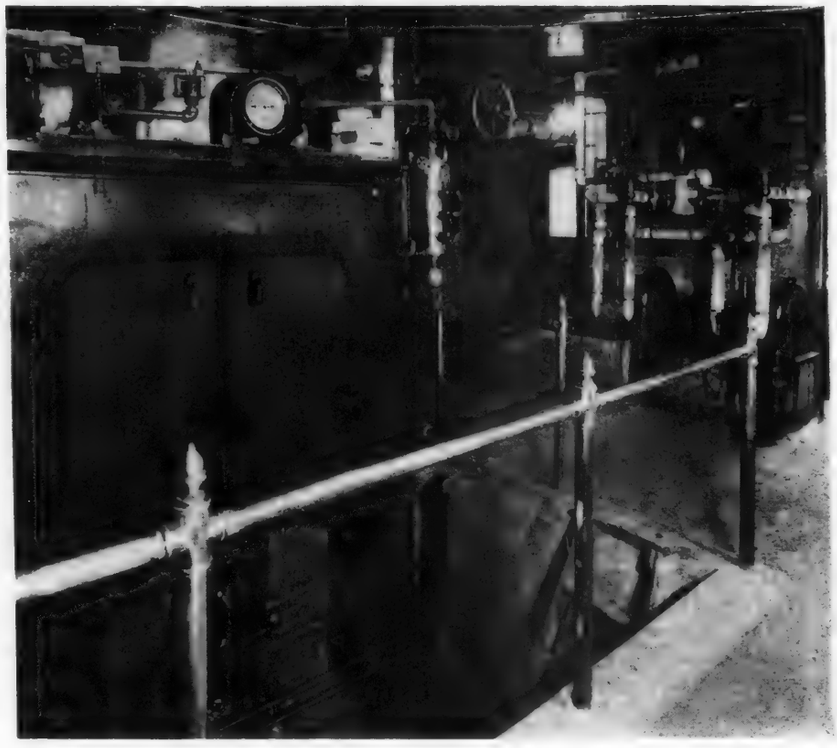
Oil Heat for the WHITE HOUSE

THE First Lady of the Land in residence in the White House will enjoy oil heat, thereby setting an example for thousands of American women—"first ladies" in their own homes. Early in the summer a burner was installed in a special boiler in the basement of the State, War and Navy Building, which furnishes steam that is piped to the White House.

A Type "C" Simplex burner with a 22K16 fan set, both in duplicate, are installed to fire a 60 H.P. Kewanee return tubular boiler.

This equipment is used 24 hours a day the entire year. Steam is taken from the boiler through underground pipes a distance of several hundred feet to the basement of the White House. Here it is distributed to the rooms of the building. Domestic hot water also is heated by this steam in the basement of the White House. Acceptance tests recently were completed by government engineers.



Oil-Fired Boiler Supplying Heat to the White House

The Heating and Ventilating Magazine's
B.T.U. Club

EVERY reader of THE HEATING AND VENTILATING MAGAZINE, *whether a subscriber or not, is a member of this club. There are no initiation fees or dues. There is not even a constitution. The club will function as a forum or round table for the informal discussion by our readers, particularly the younger men, in the industry, of topics in which they are interested, provided only that such topics pertain directly or indirectly to heating and ventilation.*

Effect of Pressure on Fuel Consumption

THE discussion of the effect of pressure on fuel consumption has aroused considerable interest. The following letter was received from the mechanical engineer of one of the largest heating contractors in the metropolitan district:

MR. CHAIRMAN:

I read, with considerable interest, the question and answers regarding the comparative fuel requirements of heating systems operating at 2.3 lbs. and 15.3 lbs. pressure, as given in your October number and am sending you a contribution to the discussion.

In a heating system the heat content of the fuel can leave the system only through the several ways listed below. An examination of these will show us where to look for any change in fuel requirements.

First, there is the loss due to unburned coal removed with the ashes. There is no reason to believe that this loss would change.

Second, there is a loss from radiators which the problem says are to be changed to compensate for the increased steam temperature.

Third, there is a loss from the piping and boiler to the surrounding air. The loss from the steam surfaces would increase according to the following expression:

$$\frac{250.3°-70°}{219.4°-70°} = 1.207$$

where 250.3° is steam temp. at 15.3
219.4° is steam temp. at 2.3
and 70° is the assumed temperature of the surrounding air. The loss from the returns would increase according to the expression:

$$\frac{\frac{1}{2}(250.3° + 242.9°) - 70°}{\frac{1}{2}(219.4° + 212.0°) - 70°} = 1.212$$

This is an increase of about 21% of the pipe and boiler loss at the lower pressure, but since the loss from pipe and boiler in ordinary installations is not more than 20% of the total heat given to the water the fuel loss is not more than 4% greater. Some of this will be useful in case of exposed risers, etc., which would reduce the part of the 4% that would be wasted. Also in a new system the money saved by smaller radiators and pipes could be used for additional covering which would actually make this loss less than it would be with the low-pressure system.

Fourth, there is the flue loss. To get an idea of the change in this, assume the gases to leave the fire at 2100° and to leave the boiler at 600° for 2.3 lbs. pressure and 625° for 15.3 lbs. pressure. These figures give a mean temperature of 1160° and 1175°, respectively, and the decrease in absorption by the boiler water can be expressed:

$$\frac{1175° - 250.3°}{1160° - 219.4°} = 0.983$$ times as much heat absorbed at 15.3 lbs. as at 2.3 lbs.

To check the assumed 625, compare the ratio of the heat given to the boiler by the flue gas in each case.

$$\frac{2100° - 625°}{2100° - 600°} = 0.9825$$ times as much heat given up by the gas in the higher pressure boiler which agrees with the ratio of the amounts absorbed by the water. This shows that about 1.7% more coal will be needed to balance this loss.

The increase in draft due to increase in flue temperature may change these calculations somewhat but this effect could hardly be determined except by experiment. The raising of the temperature of the return water has not been considered because the error due to this omission is negligible.

More radiant heat and less convected heat is generally considered to increase the efficiency of radiator heating due to less heating of the ceiling and more heating of the space nearer the floor. Since the higher steam temperature increases the percentage of radiant heat this will help to balance the losses.

If no extra covering is put on, pipe sizes are not changed and the possibly more efficient radiator heating and useful pipe radiation are not considered, the fuel used should be approximately $\frac{100}{98.3} \times \frac{104}{100} = 1.058$ times as much with the 15.3 lb. system as with the 2.3 lb. system or a 5.8% increase.

Glen Rock, N. J. M. A. R.

The engineer, who submitted the following solution to the problem has incorrectly assumed that the same amount of steam would have to be evaporated under either pressure. This solution takes into account the fact that the latent heat of the steam changes with the pressure but it evidently was forgotten that the radiation in the room was changed to conform with the difference in latent heat.

MR. CHAIRMAN:

Your question about the heating system is a good one. I would say that the owner would save more fuel operating on 15.3 lbs. pressure with a return water temperature of 242.9°. My conclusion is based on the following:

Total heat per pound of steam at 2.3 gauge pressure = 1154.6 B.T.U.

Heat of feed water at 212° = 180 B.T.U.

Therefore, heat added to pound of steam = 974.6 B.T.U.

Total heat per pound of steam at 15.3 gauge pressure = 1165.7 B.T.U.

Heat of feed water at 242.9° = 211 B.T.U.

Therefore, heat added per pound of steam = 954.7 B.T.U.

From the above it may be assumed that since less heat is added per pound of steam using 15.3 lbs. gauge pressure less fuel will be used.

Fort Wayne, Ind. F. M. S.

MR. CHAIRMAN:

Here is my solution of the problem offered in this month's issue relative to the effect of pressure on fuel consumption.

The latent heat of steam at 2.3 lbs. gauge is 961.1 B.T.U. per lb.

The latent heat of steam at 15.3 lbs. gauge is 939.2 B.T.U. per lb.

This would mean that 961.1 B.T.U. must be absorbed by 1 lb. of water at a temperature corresponding to the pressure of 2.3 lbs. gauge to cause this pound of water to flash into steam at 2.3 lbs. gauge.

Likewise, 939.2 B.T.U. must be absorbed by 1 lb. of water at 15.3 lbs. gauge to cause it to flash into steam at 15.3 lbs. gauge.

Since more heat must be applied to the heating surface of the low-pressure boiler it would seem that more coal must be consumed by the low-pressure boiler.

New York, N. Y. J. H. W.

The answer from A.R.B. states that the same amount of water will be evaporated in each case. That this is not the case is shown by his solution where he shows that 26.13 lbs. is evaporated at 2.3 lbs. pressure and 25.9 lbs. at 15.3 lbs. So far as the calculations go, A.R.B.'s answer is correct, but he draws the wrong conclusion from his solution and fails to give proof for his final conclusion.

MR. CHAIRMAN:

My solution of the fuel consumption problem is as follows:

For calculation, assume 100 sq. ft. of radiation at 2.3 lbs. pressure, and a constant of 1.7 B.T.U. per hr. per degree difference for the amount of heat transmitted through 1 sq. ft. of surface of the radiator.

Temperature of the steam at 2.3 lbs. pressure—219.4°.

Temperature of the steam at 15.3 lbs. pressure—250.3°.

1.7 (219.4° — 70°) — 253.98 B.T.U. per sq. ft. of radiation.

1.7 (250.3° — 70°) = 306.51 B.T.U. per sq. ft. of radiation.

Latent heat of steam at 2.3 lbs. pressure is 965.6 B.T.U.

Latent heat of steam at 15.3 lbs. pressure is 945.1 B.T.U.

965.6 B.T.U. per lb. ÷ 253.98 B.T.U. per sq. ft. = 3.80 sq. ft. per lb. of steam.

945.1 B.T.U. per lb ÷ 306.51 B.T.U. per sq. ft. = 3.08 sq. ft. per lb. of steam.

Converting these we have:

For 2.3 lbs. — 0.264 lbs. of water per sq. ft. of radiation.

For 15.3 lbs. — 0.324 lbs. of water per sq. ft. of radiation.

With steam at 15.3 lbs. pressure and a corresponding higher temperature, the same heat loss may be overcome with less radiation.

For 100 sq. ft., we have 100 x 25,398 B.T.U. and this result divided by the B.T.U. per sq. ft. for 15.3 lbs. is 25,398 B.T.U. ÷ 306.51 B.T.U. per sq. ft. = 82½ sq. ft. That is, 82½ sq. ft. will do the same amount of work at 15.3 lbs. as 100 sq. ft. will do at 2.3 lbs.

Water evaporated in each case:

2.3 lbs....100 sq. ft. x 0.264 lbs per sq. ft. = 26.4 lbs.

15.3 lbs.....82½ sq. ft. x 0.324 lbs. per sq. ft. = 26.6 lbs.

Factor of evaporation at 2.3 lbs. = 965.6 ÷ 970.4 or 0.99.

Factor of evaporation at 15.3 lbs. = 945.1 ÷ 970.4 or 0.97.

26.4 lbs. x 0.99 = 26.13 lbs. evaporated at 2.3 lbs. pressure.

26.6 lbs. x 0.97 = 25.90 lbs. evaporated at 15.3 lbs. pressure.

These results show that the same amount of water will be evaporated in each case, and consequently there will be very little difference in the cost of heating as far as the above calculations are concerned. However, due to the higher combustion rate and higher stack temperatures and also the fact that the heat absorption by the boiler will be less, the boiler efficiency will be lowered in the case with the higher pressure, and this means more coal per pound of water evaporated.

Utica, N. Y. A. R. B.

Members of the B.T.U. Club will be interested in the correspondence from T. W. Reynolds concerning the effect of radiator enclosures, Page 89. To support his claim, data is submitted from the 1928 *Guide* and there is no doubt that engineers are too little acquainted with the latest findings along these lines. So far as the relative advantages and disadvantages of brass and cast-iron used as heating surface in cabinet or concealed heaters, or enclosures is concerned, this subject might be called controversial. At any rate, the members of the B.T.U. Club are invited to send in their opinions of the comparative effects obtained by using cast-iron or brass for this purpose, as this is a live subject.

Defective Gas-Heating Appliances Constitute Menace

The United States Bureau of Mines of the Department of Commerce has issued a warning to owners of poorly constructed heating appliances. Householders will be using more gas as the colder weather approaches and simultaneously will decrease ventilation by closing up their homes in order to maintain a comfortable temperature. Many persons suffer discomfort and ill-health in the form of lassitude, languor, headache and nausea without suspecting the cause to be carbon monoxide arising from the improper functioning or improper use of their gas appliances. If given immediate attention, the existing trouble and danger of possible fatal poisoning can be averted. Much discomfort and danger can be avoided if, before cold weather arrives, the services of a competent gas man are engaged to inspect the appliances, make necessary repairs, clean dirt and lint that have accumulated in the burners during the year, and then adjust the burners so that good combustion is attained.

Commercial Standards for Unions Approved

At a general conference of interested elements of the industry, held September 24, approval was given for a proposed commercial standard for malleable iron or steel screwed unions for use with standard weight pipe. The conference was held under the auspices of the commercial standards unit of the Bureau of Standards, Department of Commerce. This commercial standard pertains to black and galvanized types of brass-seated malleable iron or steel unions.

It was agreed at the conference that new production would begin on May 1, 1929, allowing until November 1, 1929, for the industry to use up the existing stocks. The standard will be subject to annual review by a standing committee in order that it may be kept abreast of such changes as may take place in the art. At least 65% of the industry, by volume of annual production, must accept the standard in writing and with no outstanding opposition from the others, before it will be published by the Department of Commerce.

Members of the standing committee which will review the standard every year are: R. E. Bryant, of the Jefferson Union Co., Lockport, N. Y.; Myron H. S. Affleck, of the Star Mfg. Co., Providence, R. I.; Stanley G. Cady, of the Rhode Island Fittings Co., Providence, R. I., representing the manufacturers; The Standard Sanitary Mfg. Company, Fleck Brothers, of Philadelphia, General Fire Extinguisher Company, Hajoca Corporation, of Philadelphia, representing the distributors; Master Plumbers Association, Master Steamfitters Association, American Gas Association, Heating and Piping Contractors National Association, representing the consumers.

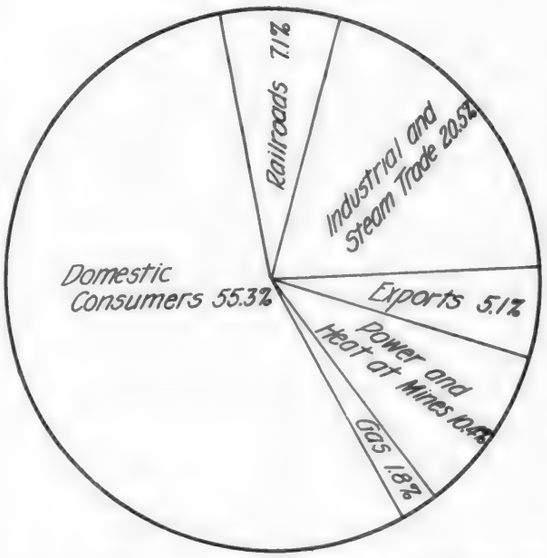


Fig. 1. Distribution of Consumers of Anthracite Coal Graphically Shown by the Use of a "Pie"

Graphs and Charts

Purpose and Use of Graphs. Errors to Avoid When Presenting Data Graphically.

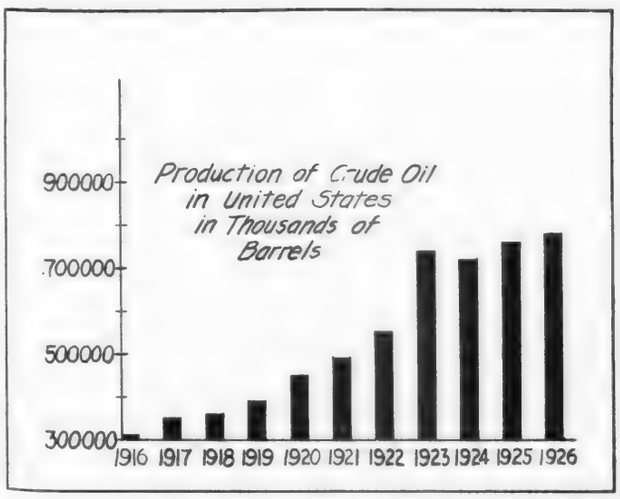
A PICTURE or "sketch" of a proposed skyscraper or school building drawn by a capable artist visualizes to any one its finished appearance. No training is required to enable one to "interpret" it. It is as full of meaning to the child of twelve as to the mature adult.

An architect prepares plans for the same building. In their simpler form these may be intelligible to the average man or women, but many of the small-scale drawings, showing location of fixtures, water and waste lines and all of the "fixaments" that go into the modern building, are so intricate that their understanding implies some experience in "reading" drawings. The detailed drawings, especially those showing steel construction, are even more difficult for the layman to comprehend.

The engineer, during construction of this building, shows progress, both in detail, and *in toto*, by the use of graphs and charts. These require the "engineering mind," if not actual technical training, for ability to interpret.

Far too few engineers, or delineators of graphic data, seem able to make these pictures mean just what they want to express. To the engineer, the properly drawn graph or chart is just as comprehensive, in its few lines, as is the many-toned "picture" of the artist in black-and-white or color. Therefore, being so limited in the number of lines permissible, the delineator should take every care to use them as effectively as possible. For the significance of a single curved line, in its relation to a pair of right-angle axes, may tell the engineer, in a glance, that he can or cannot utilize, for a specific purpose, a machine whose performance is represented by the curve.

In laying out a graph, the first consideration is the purpose it is to serve. Quite aside from the limitations of this article, are simple graphs now being used, largely in advertising and educational literature, to convey concepts of growth or of proportion. An elementary line or block graph will picture to the average layman the rate of growth of his city; a "pie" diagram—a circle divided into several (usually unequal) sectors—plainly shows the relative amounts of coal used by different classes of consumers. Graphic presentation of this sort seldom contemplates exact translation into the units involved; usually they are intended to tell, at a glance, relative proportions.



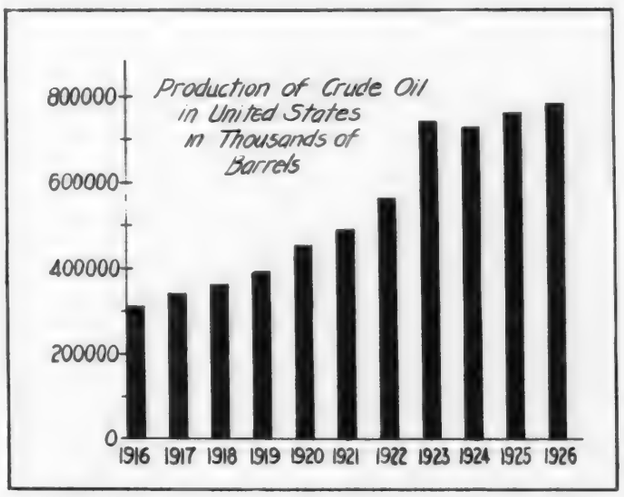


Fig. 2. Wrong and Right Methods of Delineating Annual Growth

The production for the year 1926 shown to be (at first glance) about fifty times that of 1916—a tremendous increase.

Instead of being fifty times that of 1916, production for 1926 is shown to be only 250% of that of 1916.

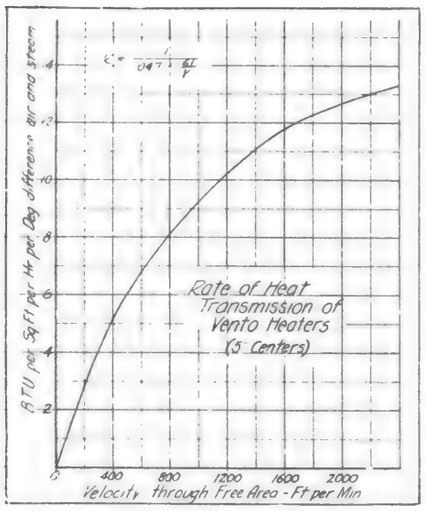


Fig. 3. Line Graph Showing Independent Variable on the Horizontal Axis and Dependent Variable on the Vertical

Many graphs, however, especially those of linear character, are prepared to enable the engineer to "take off" quantities with a reasonable degree of accuracy. Again, a graph may be prepared from experimental data, where the ability to determine interpolated or extrapolated values is the essence of the graph. Another type of graph portrays action, reaction or trend in natural phenomena.

So it will be seen that the purpose of the graph must be known before its technique can be determined. Every graph that represents finite quantities must have a datum line. Quantities, positive or negative, are portrayed by a line, curved or straight, above or below this datum or base line. A vertical scale must be given, and where the quantities are both positive and negative, the datum line is the zero point of the vertical scale. If all quantities are positive, or all negative, the base line need not be the zero of the scale.

For instance, it may be desired to show variations in steam temperature, between 160° C. and 235° C., but only with regard to absolute zero. As this base is — 273° C., we would be dealing with quantities between 433° (273° + 160°) and 508° (273° + 235°). Manifestly, if we laid out a graph on this basis, making the vertical scale 0-600, we would have a vertical scale so small in that portion we desire to utilize that the graph would be useless. Suppose, however, that we were to take the same area of graph and make our base line at the 400° line. Then each of the six vertical divisions, instead of covering 100° would, with a maximum scale of 550°, extend over but 25°, and the curve could be "read" with four times the accuracy of the first curve. Care must be taken, however, that such procedure does not distort the curve or make it falsify the very facts it seeks to present, as shown in Fig. 4.

Nearly all of the graphs used by heating and ventilating engineers show the relation between two variables, one of which is called dependent, and the other independent. What happens to one variable is *dependent* upon the changes in the other. In such a case it is necessary to have *two* lines of reference, instead of one, and these intersect at right angles, the common point being taken as zero. If we lay off divisions on the horizontal line, starting with zero at the left, representing the changes of the independent variable, and then space off divisions from the same zero on the vertical line, representing the scope of changes in the dependent variable, a fair line connecting different possible relations of the two variables becomes our picture of what happens when the values of the independent variable are changed.

(To be continued)

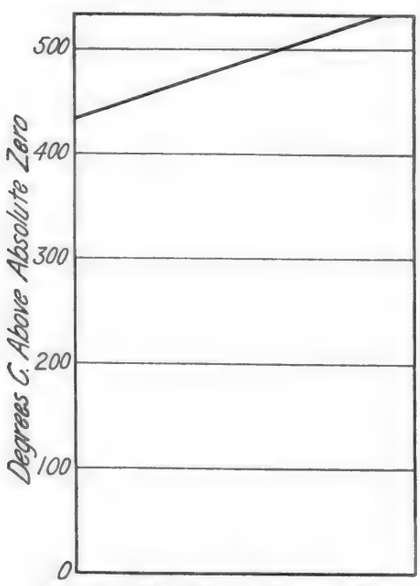
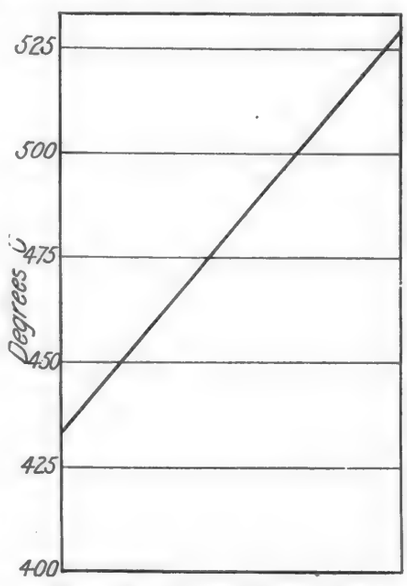


Fig. 4. This Graph Cannot Be Read Accurately Due to the Wide Range of the Ordinates



A More Easily Read Graph Is Obtained by Charting Only the Ordinates Within the Range of the Graph

Power Show to Feature Motion Pictures

One of the features of the Seventh National Exposition of Power and Mechanical Engineering at Grand Central Palace, December 3-8, will be a motion-picture program, running through the entire week of the show. Films will be from one to five reels in length, some of them being shown for the first time. The program will consist of the following films:

"Controlled Heat," illustrating the control of fire and the transmission of energy in the form of heat to work for the comfort of man, and "The Heat Thief," both by the Hoffman Specialty Company; "The Handling of Heat," showing the use of Norton refractories in industry; "The Manufacture of Timken Steel Roller Bearings"; "Freezing Out Fires," which demonstrates the effectiveness of Fire-Freez carbonic gas as an extinguishing medium compared with foam or carbon tetrachloride; "Electrical Measuring Instruments"; "Controlling Fire in the Dip Tank"; "The Age of Speed"; "From Coal to Electricity"; "Power," showing the amazing growth in the use of power as compared with 150 years ago; and "Conowingo," which shows the building of the important water power project on the Susquehanna River.

Errata

In the article "Heating a Suburban Home With Gas" in the October issue, an erroneous impression was unintentionally created, and this, coupled with a proofreader's error, caused an incorrect figure to be given for the annual equivalent cost of coal for this house.

In the manuscript submitted, the statement was made that "this is equivalent to 23¾ tons of anthracite coal at $14.50 per ton." Another portion of the manuscript said "17 tons, which at $13.75 per ton amounts to $233.75." In going over the copy it was thought that there was a discrepancy between the two figures and $14.50 was used as the normal price of coal in the community in question.

The statement in the latter part of the article that "17 tons of coal at $14.50 per ton amounts to $146.50" was the proofreader's error, as this should have been $246.50. According to the author's findings, this should have been 17 tons at $13.75, or $233.75.

Wiring Practice and Precautions in Oil-Burner Installation

By C. P. Packard

Engineering Department, Petroleum Heat & Power Company

IT is impossible to determine the most important element in an oil-burner installation, but it must be agreed that the electric wiring plays a part as vital as any. Should trouble occur on the supply lines to the house, the burner motor stops, the controls are rendered useless, and heat production is stopped. If the low-voltage wires become broken, loose, or damaged, the controls cease to function and the set either fails to start, or, if the wires are broken during operation, fails to shut down, and the unit continues to run until the boiler safety-control cuts off the supply to the burner or until the safety valve warns the owner that everything is not right in his cellar.

To make an installation that is dependable, carefree, and safe, is not difficult, but there are certain precautions that must be adhered to if these characteristics are to be obtained. A wiring installation for an oil burner does not differ materially from any good conduit installation, and if the National Electrical Code rules are followed, good materials used, and careful work done, there should be no service calls from this source.

Rigid conduit is recommended for all installations and, in most localities, is required by local ordinances. Such conduit differs from standard pipe in that it is made of mild steel, has all burrs removed from the inside, and is covered with protective coatings on the inside and outside. There are several steps and methods used in conduit manufacture. The burrs are generally removed by passing a steel ball through the pipe. This ball has a diameter nearly equal to the inside diameter of the pipe and when passed through, leaves the inside free from rough spots and burrs. A sulphuric acid bath is then used to remove the scale and foreign matter. This is followed by a wash with hot water which removes the acid and leaves the pipe ready for coating with the protective material.

There are five classes of rigid conduit all of which have their advantages and value. The cheapest probably is the enameled grade which merely has a coating of enamel on the inside and outside to protect the pipe. This type has proven very durable when ordinary care is taken and when the installations are not subjected to moisture. As long as the enamel remains intact, the pipe cannot corrode, but when nicked, or scratched it corrodes easily and is not dependable.

Galvanized conduit has both surfaces coated with zinc. This is applied by one of three methods: The electro-galvanizing process, the sherardizing process, or the hot-dipped-galvanizing process. The first two methods generally are used because of less cost and due to the fact that the latter is conceded to be better only where corrosive fumes are prevalent.

A third type of conduit is the zinced-outside-and-enameled-inside rigid conduit. This type is commonly used, as the inside is seldom subjected to injury and the enameled coating serves to make the pulling of the wires easier. A next-best grade has the outside zinced and the inside zinced and enameled, while the best grade has both the inside and outside zinced and enameled.

These grades and methods of finishing conduit are mentioned merely for information and to help impress upon heating contractors, electricians, and installation men, the care taken in conduit manufacture and the necessity of using approved electrical conduit and *not* water or gas pipe.

How to Install Conduit

A run of conduit should be installed as a unit and then the wires should be pulled through. Avoid having elbows with radii of less than 3½ in. on the inner curves. After a length of conduit has been cut with a hack saw, be sure to use a reamer and remove the burrs which always are left. Never use wire smaller than No. 14, and be sure good-quality rubber covered wire is obtained. Check up on the junction boxes, switches, fittings, etc., that you are using and be sure they are of the approved type. It does *not* pay to spoil the value of good material by mixing with poor. Moreover it may save work in the end should your local inspector see fit to object. The National Board of Fire Underwriters publish a pamphlet entitled "Inspected Electrical Appliances," and reference may be made to this.

It is good practice to use multiple-conductor low-voltage wire of the solid type, objection to stranded wire being that there is a possibility of short circuits occurring between the binding posts when the strands work loose, or are carelessly connected. Care must be taken not to nick the solid copper wire when the insulation is removed. A good method of removing insulation from low-voltage wire is to slip the outer covering of the wire down the required distance for the connections and then unwind the covering on each conductor. This unwound insulation then can be cut with a knife and the copper need not be touched with the sharp edge of the blade. Should the copper be dirty, however, the wire may be scraped, using the back of the blade.

When the low-voltage wires are run from Stackstat or other control to the release switch on the burner, they should be enclosed in rigid conduit where they run from the wall along the floor to the burner. This rigid conduit may terminate a short distance from the burner and flexible conduit may be used to finish the run. It is important for protection and appearance to use an "Endo" or some sort of bushing on the ends of the conduit to protect the low-voltage wires from abrasion. Keep the wires away from hot steam and water pipes and do not use these for means of support for the low-voltage wires unless some heat-resisting or insulating support protects them from the heat. Bear in mind that the low-voltage wires play an *important* part in the operation of the burner and may cause trouble and necessitate service calls if not properly installed.

It is well to bear in mind the section in the National Electrical Code rules which states that all conductors of an A.C. circuit be contained within one conduit. This means that both wires of a single-phase circuit or the three wires of a three-phase circuit, shall be run in the same conduit. Never run the low-voltage wires in the same conduit with the supply lines.

When a preliminary survey of a new installation is made, it is well to remember that if a polyphase supply is near at hand, it will be to your advantage to use it. A polyphase motor has fewer moving

parts to cause trouble, an average of 10% better efficiency and power factor, and is a smaller, better appearing motor. Should a three-wire, single-phase power supply be available, plan to use the higher or power voltage for the burner supply. A 220-volt single-phase installation always is favored over a 110-volt installation where motors over ¼ H.P. are used.

Be sure that the conduit runs are well supported and cannot easily be knocked down from the wall, or moved from junction boxes, switches, etc. Take pride in seeing that lines which run side by side are really parallel and spaced equally. Where bends are made, see that they are neat and that they will allow the wires to be pulled through easily and without damage to the insulation. If the lines run along the floor any distance, or in places where they are subjected to damage or may be in the way, take time to place them in a trench and cover them with concrete. This will add to the appearance of the installation. When a room thermostat is installed, see that it is absolutely vertical when finished and make it an asset rather than a liability to the appearance of the room.

Don't forget that the rules require that all conduit be grounded. If you ground your lines to the house side of the water meter and the other lines are grounded to the street side, be sure to "jump" the meter with a substantial wire. Solder all connections to the water pipes and to the conduit also throughout the system where connections are made — it pays. Fuse the lines so you will have *real* protection. To put in 30 ampere fuses where they should be of 15-ampere capacity is like omitting a safety valve or fusible plug on a boiler. Work *with* your inspector, not against him, for he is only trying to make wiring as safe as possible.

Finally, observe the rules of the game; don't try to use something cheap in an installation. Be neat and careful and then your salesmen will be able to use your carefulness in appealing to the customer's sense of safety and reliability and you can feel free from trouble on the wiring end.

Kansas City Laboratory Issues Oil Handbook

Petroleum products and natural gas are treated in the "Handbook of Petroleum, Asphalt and Natural Gas," issued by the Kansas City Testing Laboratory as Bulletin No. 25, (1928 Revision). The text is edited by Roy Cross. It contains the physical and chemical properties, specifications, methods of analysis, economics, statistics, refining processes, patents, tables and bibliography of all petroleum products and natural gas.

Of interest to heating men are the sections that deal with fuel and gas oils, and gas. Under that section dealing with industrial fuel oil, the advantages of using oil fuel are given, requirements for burning oil, types of burners are described, and a general discussion of oil burning is presented. This is supplemented with charts showing the relation between gravity and heat of combustion of fuel oil, relative cost of coal and oil, relative cost of coal and natural gas, relative cost of natural gas and fuel oil, and the relation of air used to CO_2 in flue gas from the combustion of oil.

Domestic oil burning is treated in the same comprehensive manner. Besides the expository matter pertaining to the operation and construction of domestic burners, and the part devoted to the differences between industrial and domestic burners, a table shows the cost of oil and coal when burner is operating under favorable conditions and when the least efficient burner is operating under unfavorable conditions. A section of the book is given to miscellaneous data on oil heating, under which is given a tabulation showing the percentage of ship tonnage using coal as fuel in 1919 and 1920, per cent using oil as fuel under boilers, using oil in internal combustion engines, and the per cent using sail only.

Methods of testing fuel oil are separately treated, as is the comparison of oil with other fuels, in which a chart shows the fluctuation in the price of fuel oil since 1915. Full-page tables give the properties of fuel oils from various sources, types of solid and liquid fuels, relation of gravity to heat of combustion of dry fuel oil (B.T.U. per gallon), and the relation of gravity to heat of combustion of dry fuel oil (B.T.U. per pound).

Costs of natural and produced gas are shown together with their heating values, and so-called colloidal fuel, a mixture of fuel oil and powdered coal, is given a separate division. Curves show the heat losses in flue gases per pound of fuel burned. Data on boiler and furnace capacities, heat losses due to chimney gases, weight of air required for combustion of different grades of oil, the cooling effects of various percentages of excess air, fuel losses in practice and radiant heat — all get special treatment.

Gas flow and compression, measurement of gas flow, orifice capacities, and the methods of analysis for natural gas and petroleum products get special attention in this book. Other sections deal with the production of natural gas, typical composition for commercial purposes, analysis of gas from principal fields, typical gas prices, and gas-pressure conversion tables.

This handbook contains 832 pages. It is liberally illustrated with charts and graphs that present the material in picture form. It is well and simply written, and can be understood by the non-technical reader. The price of the book is $7.50 and it can be obtained either from the Kansas City Testing Laboratory, Kansas City, Mo., or through the book department of THE HEATING AND VENTILATING MAGAZINE.

Fuel Oil Distribution Analyzed

Fuel oil and gas oil distribution in the United States, during 1927, amounted to 333,760,000 bbls. of 42 gals., as compared with 334,030,000 bbls. in 1926, a decrease of 300,000 bbls., according to a national survey of fuel oil distribution recently completed by E. B. Swanson, economic analyst of the Bureau of Mines, at Washington. His findings in detail are given in a booklet, National Survey of Fuel Oil Distribution, 1927, which was compiled in cooperation with the American Petroleum Institute.

Oil for heating purposes in commercial bulidings increased to 15,143,245 bbls. in 1927, from 13,874,181 bbls. in 1926. There also was an increase in domestic consumption from 9,080,000 bbls. during the calender year of 1926, to 12,377,000 bbls. in 1927. Every section of the country showed an increase in the amount of oil used for heating except the South Central States and the South Atlantic States. The decrease on the first group is accounted for by the increase in the use of natural gas for heating.

The table that follows shows the distribution of gas oil and fuel oil in barrels according to uses.

	1927	1926
Steamships	88,215,000	79,288,000
Railroads	70,094,000	72,218,000
Exports	47,391,000	38,351,000
Used as fuel by oil companies	43,453,000	48,701,000
General manufacturing	40,815,000	44,282,000
Gas and electric companies	29,775,000	33,651,000
Smelters, foundries and steel mills	24,028,000	25,054,000
Heating of buildings	21,521,000	16,779,000
U. S. Navy, transports, etc.	15,859,000	14,057,000

Correspondence

Conducted by T. W. Reynolds

Effect of Enclosures on Heat Emission of Radiators

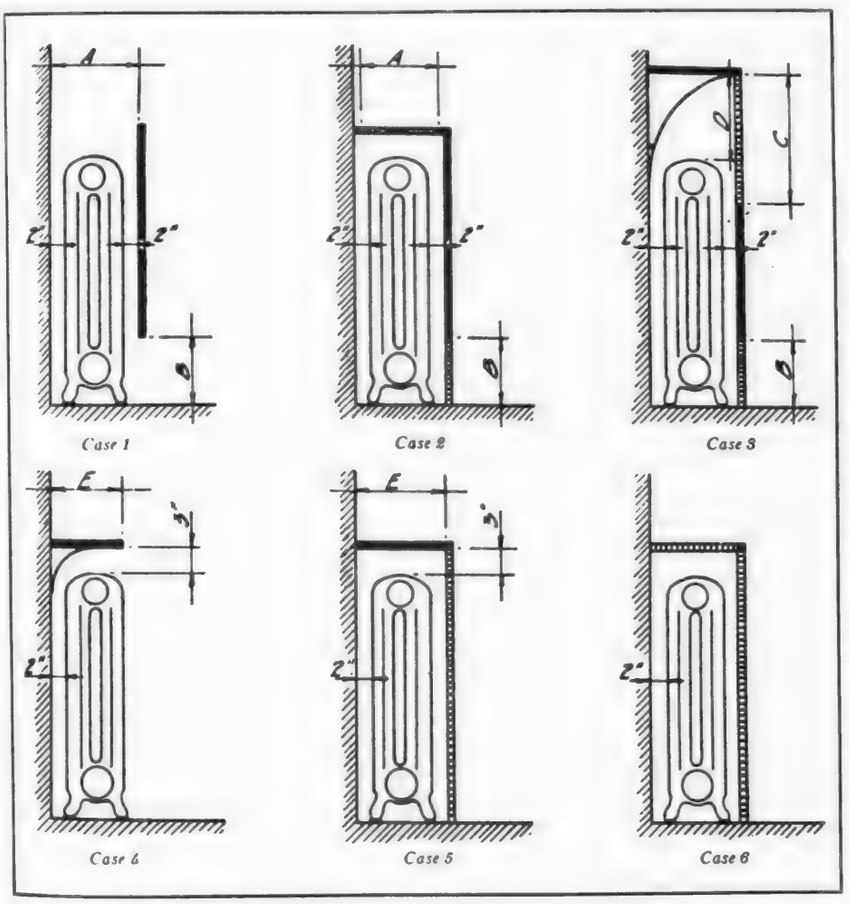
EDITOR HEATING AND VENTILATING MAGAZINE:

Many engineers still add 25% to 30% to the required heating surface wherever such surface is concealed or enclosed, notwithstanding authoritative test data to the contrary. The latest expression of this practice and the especial cause of the above comment is the statement in THE HEATING AND VENTILATING MAGAZINE for September, under the caption "Concealed Radiation," that allowances as much as 30% must be made where cast-iron radiators are concealed for decreased heating effect.

Referring to Page 77 of the 1928 A.S.H. & V.E. *Guide*, we find illustrated six types of enclosures which, when constructed as shown, make the radiator enclosed more efficient or deficient, as the case may be, varying from 10% more efficient to 35% less efficient than the radiator unenclosed. In the reproductions herewith it will be noted that Cases 4 to 6 are less efficient, varying from 5% to 35%, but such enclosures are rarely built, while Case 1, which is 10% more efficient, also is seldom encountered. We do find such cases as No. 2 fairly often and this is 5% more efficient, but the most common and quite familiar enclosure is Case 3 which is equally as effective as a direct radiator.

As stated in substance in the *Guide*, whereas the use of an enclosure often retards heat emission from the radiator it is counterbalanced by the greater effectiveness of the heating due to flue effect. This is not as generally recognized as it should be.

Now, if we use the usual form of enclosure, Case 3, with no addition, as duly authorized and with proper enclosure, we find that just as much cast-iron as brass in terms of equal rated surface may be installed in any given enclosure, except where the required rating surface is so great that the brass radiation is double-tiered in height. This is due to the fact that the space required for effective draft head above the brass radiator may well be occupied and used to advantage by cast-iron radiators, as shown in Case 3.



© A.S.H. & V.E. **Typical Arrangements of Enclosures on Radiators**

Case 1 is 10% more effective than a direct radiator when properly constructed.
Case 2 is 5% more effective than a direct radiator when properly constructed.
Case 3 is equally as effective as a direct radiator when properly constructed.
Case 4, with E equal to one-half A—percentage of reduction is 10%.
Case 4, with E equal to A—percentage of reduction is 20%.
Case 4, with E equal to one and one-half A—percentage of reduction is 35%.
Case 5, with E equal to A—percentage of reduction is 30%.
Case 6, percentage of reduction is 5%.

Exception in Case of Shallow Enclosures

A further exception with cast-iron radiators is where enclosures are only 3 in. or 4½ in. deep. In such cases wall radiation can be used but only within certain limits so that a very thin or shallow type of radiator, as now made, would be required. Such a radiator would have to be increased in amount when so used, as it was developed largely for high radiant effect; but even with all due allowance made, it will still go in the same space and exceed the requirements. Incidentally, this radiator when semi-concealed, as ordinarily intended, requires at the most an additional surface of only 10% because there is still left the exposed broad surface for radiant effect. This addition would apply only where the radiator is enclosed at ends and provided with bottom register.

Such a radiator still may be properly termed concealed, rather than a semi-concealed radiator, if we concede that its front forms its own enclosure. It matters not if cast-iron or wood is used for this purpose if the effect is one of concealment. The basic idea of a concealed radiator is one of appearance, hence, if we make the radiator so that it appears as if there were none or even exclude the hitherto objectionable features of a direct radiator, then we have concealed the radiator in effect if not in location.

T. W. REYNOLDS

New York, N. Y.

Huge Tunnel Projects Follow Success of Holland Tubes

EDITOR HEATING AND VENTILATING MAGAZINE:

Your article on "Huge Tunnel Projects Follow Success of Holland Tubes" in THE HEATING AND VENTILATING MAGAZINE for October, was read with interest.

You stated that studies of air conditions within the Liberty Tunnels figure pre-eminently in the plans for the Holland Tunnel. I do not quite understand what you had in mind in this statement. I designed the Holland Tunnel ventilation, but did not use any data from the Liberty Tunnels. As a matter of fact, the ventilation of the Liberty Tunnels was based on results of experimental investigations made by the Holland Tunnel Commission.

Also, I note that 16-ft. fans will ventilate the Estuary Subway at Oakland, Calif. I assisted in the design of the ventilation system of this subway. The above statement about 16-ft. fans should read "16 fans driven by 100 H.P. motors, etc."

In your article you also fail to mention a very large tunnel project which now is in an advanced state of construction. I refer to the tunnel between Liverpool and Birkenhead under the Mersey River in England. This tunnel has an inside diameter of 44 ft. and a length of 15,465 ft. This also is a vehicular tunnel which will no doubt be ventilated in a similar manner to the Holland Tunnel.

A. C. DAVIS

Ridgefield Park, N. J.

Improving the "Underwriters" Boiler Connection

EDITOR HEATING AND VENTILATING MAGAZINE:

Like many others, I have had considerable trouble with the so-called "Underwriters" connection for bringing wet returns to the boiler. This connection looks ideal on paper, but it is often much too noisy in practice to prove satisfactory, so I have become "gun shy" and am afraid to take any chances with it. Placing the connection under the water line as often recommended does not hold the water line and is only an emergency safety device.

I am of the opinion, however, that a connection with a "Y" fitting, as shown in the illustration (Fig. 1), might prove satisfactory, as it exposes a very small surface of cool water to the steam. I should very much like to have the opinion of others as to this, as, if this connection can be made noiseless, it should generally be used.

Newark, N. J. J. O. G. G.

Many successful installations have been made with a connection at the boiler variously known as "Underwriters," "Hartford Loop," or "Safety Loop." Unfortunately, it sometimes is poorly installed, not properly submerged below water line or properly piped from the steam header, or else it is used with too long a horizontal connection as at "A" (Fig. 2).

Such a long run can be shortened by dropping the pipe immediately for a few inches to point "B" and then continuing the horizontal to point "C", as shown dotted, or as much farther as may be necessary. In this respect, our correspondent goes us one better and produces the shortest connection possible (Fig. 2). This is certainly a better connection which, critically reviewed, discloses no weakness as to possible detriment along other lines.

Connection "D" (Fig. 2) is to be preferred to connection "E" (Fig. 1), because it is less likely to permit pounding due to receiving condensate as it is taken off of the vertical. It also produces true boiler pressure at the loop. This is because of the shorter run, furthermore the weight of steam flowing to produce pressure drop is less at "D" than at "E."

It would appear from the question that the "Underwriters" connection is required only with wet returns. Its use, however, is just about as important with dry as with wet returns.

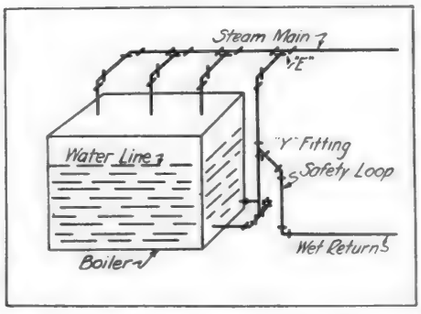


Fig. 1. Elementary Form of "Underwriters Loop"

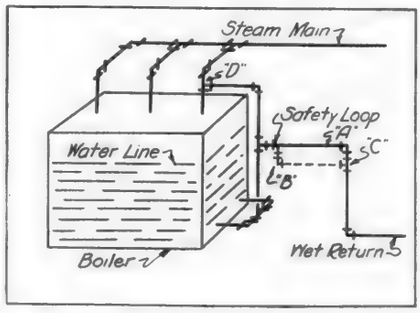


Fig. 2. Form of Loop Suggested to Correspondent

Is It Practical to Operate a One-Pipe and Vacuum System Together?

EDITOR HEATING AND VENTILATING MAGAZINE:

I was very much interested in the correspondence in THE HEATING AND VENTILATING MAGAZINE for September, on Page 86, relative to the possibility of operating a one-pipe and vacuum system together, because it represents a very common problem. It appears to me that the solution given would be quite satisfactory for a vapor system, but with a vacuum pump on the line I certainly would want to assure myself that installations of this kind could be operated without trouble before I took the risk of installing one.

With such a system, it would be necessary to have a positive steam pressure on the radiators in building No. 1 in order to expel the air, while in building No. 2 it would not be necessary, and in fact it would appear advisable not to start the vacuum pump until all the radiators in building No. 1 were full of steam. Even after that there always would be a tendency for building No. 2 to rob building No. 1, owing to the greater pressure differential on the radiators caused by the vacuum pump.

I can see that with very careful operation, the system might be made to work, but there appears to me to be too many chances of trouble to make this sort of installation attractive. I should like very much to know whether such systems actually have been installed, and what the operating experience has been.

Newark, N. J. J. O. G. G.

A combined system is operating satisfactorily in a synagogue in Brooklyn. The system is vapor, and not vacuum, and at times pressure has to be raised, but many vapor systems are now running closed and under pressure. Had more modern air valves been obtainable, results might have been even more satisfactory, as air valves now can be obtained which vent freely at 4 oz. or more slowly at 2 oz. of pressure. A similar system installed 10 years ago in the newer building of the Allenwood School at East Orange, N. J., is still working without unfavorable comment.

At Ninth Avenue and Twentieth St., New York City, there is another combined system, in fact a three-in-one system, for it ties together a one-pipe, two-pipe and vacuum-pump system. Two boilers are used with valves for separate operation, these valves being opened in colder weather when pressure is required. This system appears to

give satisfaction though many would hesitate to design such a system due to the possibility of one valve being closed while the other was open, thus causing one system to flood and the other to be partially emptied with resulting damage to the boiler under low water line. In this connection it may be said that should such a condition take place it will not necessarily cause damage to the boiler; that is, provided safety loops are used and cold water is not admitted to the boiler in considerable quantities.

It is true, as pointed out by the correspondent, that a greater pressure differential exists at the radiators on the pump job but this need not rob the other system of steam, for it is presumed that the boiler is powerful enough to furnish the steam necessary for both systems, and that the pipes are large enough to distribute this steam without discrimination. It does not matter if the pump job does circulate more quickly, for it will do that even if operated separately. There is no change in this respect; therefore, no harm is done by combining the two systems. In fact, this is better than making both systems one-pipe or, at great expense, making both systems vacuum.

Sex Appeal in Sectional Boilers

EDITOR HEATING AND VENTILATING MAGAZINE:

We hear a good deal these days about manufacturers of heating equipment going crazy over colors. Just recently I was talking with an engineer who said that the elaborate finish on sectional boilers was a lot of nonsense.

How like engineers to look only for efficiency of product and care nothing for appearance! Had engineers cared for appearance, including their own dress, they might have gone farther than they are today. They wanted radiators to heat—nothing more—but the good-looking radiators came just the same; in fact the demand for improved appearance was so great that some conceal the radiators altogether.

Now boilers are going to colors. The engineer distrusts the color appeal as detracting from thoughts on efficiency, but hard-boiled manufacturers know what they are doing, and colors are here to stay. Flowers, bees and birds have all used color for sex appeal for years, and there is no reason why heating devices should not be beautiful as well as useful. Architects enthuse over colored boilers and beautiful radiators.

T. W. REYNOLDS

New York, N. Y.

One Chimney for Three Oil-Burning Boilers

EDITOR HEATING AND VENTILATING MAGAZINE:

I am interested in a heating plant with three boilers burning coal, and using a single stack. I would like to install an oil burner in one of these boilers and want to know if I should have a separate stack, or whether the single boiler burning oil will work in parallel with the two boilers burning coal, without objectionable reaction.

M. R. L.

Chicago, Ill.

Under ordinary conditions it would not be necessary to have a separate stack for the oil burner. It would be necessary, however, to put an individual damper in the flue pipe from each boiler. You then will secure satisfactory parallel working through the proper setting of each individual damper. It might be mentioned that in a large New York hotel there are 11 boilers developing approximately 350 H.P. each. Normally, seven of these burn coal and four burn oil, all working in parallel in perfect harmony.

Conference of Trade Commission and Publishers

Two hundred representatives of periodical publishers, principally magazines of general circulation, were present at the trade practice conference of the publishers held in New York, October 9, by the Federal Trade Commission to discuss ways and means of preventing fraudulent advertising.

The decisions reached at this conference were that individual cases which may come before the Federal Trade Commission or before the publisher should be presented before the National Better Business Bureau, which will organize a conference for the discussion of the problem. It was decided that the Associated Business Papers should set up a suitable committee which would represent them in the National Better Business Bureau so as to make possible the handling of cases of misrepresentative advertising through that organization. The National Better Business Bureau announced that they would be in a position to handle such cases, whether the publishers were members of the Better Business Bureau or not.

After considerable discussion and minor amendments, the following resolutions were adopted:

"WHEREAS, at this conference on trade practice for periodicals, held in response to the call of Hon. W. E. Humphrey, chairman of the Federal Trade Commission, Chairman Humphrey said in part '.... The majority of periodical publishers not only obey the law but often go far beyond what the law requires in selecting the advertisements they will publish.... I do not believe there is an industry in America conducted by more honest, high-minded, public spirited men and women than the publishing industry. I do not believe that any industry in America has greater power for good.... I believe that the future greatness and security of the nation rest to a greater extent upon the publishing industry than any other.'

"BE IT RESOLVED that we express our sincere appreciation of such commendation, from so high an official and personal source, of the principles and conduct of the publishing industry; and

"WHEREAS, the record of the publishing industry for many years past shows that the very great majority of such publishers have, of their own initiative, taken measures to eliminate fraudulent advertising from their columns, and have welcomed every practical suggestion to increase the efficiency of such measures.

"BE IT RESOLVED that we recognize the fact that the National Better Business Bureau, an organization composed of and supported by the businesses of advertising, is the most competent agency of assistance to the businesses of advertising in preventing frauds in advertising and selling; and that said Bureau has expressed its willingness to cooperate in every way with publishers in eliminating fraudulent advertising.

"BE IT FURTHER RESOLVED that we desire and will welcome every cooperation and assistance of the National Better Business Bureau; and said bureau having expressed its willingness and ability to do so, that we request said bureau to advise periodical publishers generally, and, whenever deemed advisable, any governmental agency, whenever advertising which is being published, or is likely to be offered for publication, is established by said National Better Business Bureau to be fraudulent upon reasonable investigation and notice to the person complained of."

Swedish Trains Heated by Electricity

Most of the Swedish trains on the Gothenburg-Stockholm branch of the Swedish State Railway now are heated by electricity. Aside from its feature of cleanliness and comfort, the new method has cut the expenses of heating the cars more than half.

When steam was used, the annual heating cost for this line was $93,800, whereas the electric system entails an outlay of only $43,180. Electric heating apparatus is used on 1350 cars of this railway system.

Plant and Employees of the Kewanee Boiler Company, 1892

Glancing Backward

High Lights in the Evolution of Leaders in the Heating and Ventilating Industry

IX—Kewanee Boiler Corporation

OUR country was still in the atmosphere of the close of the Civil War—the assassination of President Lincoln—the ramification of the abolition of slavery—and the troublesome days of reconstruction (an atmosphere somewhat analogous to that existing at the close of the world's greatest war)—when what is now the Kewanee Boiler Company had its beginning.

During the year 1868, only a short time after the tracks of the "Burlington" had been extended beyond Kewanee, which village for some time had been the Western terminus of that road—with stage coach connections to Galesburg—a shop was built in Kewanee by a man named Anderson. This shop was devoted to the manufacture of "steam feed cookers" for the use of the neighboring farmers.

In 1871, this business had risen to the dignity of a company name of Anderson Steamer and Heater Company and in that year it erected a foundry 40 ft. by 60 ft. and a machine shop 20 ft. by 80 ft., and also installed a 40 H.P. engine to take the place of the single horse which had been furnishing the power for the original plant from its beaten path in the shop yard. In its issue of April 6, 1871, the *Kewanee Independent* characterized this plant as "the largest factory in Henry County"; thirty-five men were employed in its various shops. Prior to 1875, this company also was known as the Anderson Universal Steam Boiler Mfg. Company.

From the New England States about this time came W. E. Haxtun, who became associated with the Anderson Steamer and Heater Company. In 1875, the Haxtun Steam Heater Company came into existence, placing on the market the Haxtun magazine-feed steel heating boiler, with which the company for many years enjoyed a well-deserved success, and it was Mr. Haxtun who was the designer and patentee of this boiler.

E. E. Baker, President of Kewanee Boiler Corporation Since 1892

In 1876, the Haxtun Steam Heater Company reported to the state authorities it had "a capital stock of $50,000, used annually 10 carloads of pipe, 40 tons of boiler plate, 120 tons of cast-iron and employed from 25 to 35 hands." Along about this time the "Burlington" granted the Haxtun Steam Heater Company its first side track for exclusive use. It was also in this year that John H. Pierce became actively associated with the company. From that time on, until 1904, Mr. Pierce's name was inseparably linked with the increasing manufacturing interests of Kewanee. Prior to 1876, Mr. Pierce had been associated with his brother, Thomas P. Pierce, in the hardware business in Kewanee.

In 1873, there came from a Kane county farm, near Aurora, Ill., a lad of 18, whose destiny henceforth was to be closely interwoven with the best of Kewanee's commercial, civic and social affairs—Emerit E. Baker. Mr. Baker first officiated as office boy for the Ander-

Haxtun Magazine Feed Boiler, 1876

son Heater Company at its Chicago office on Lake Street, coming to Kewanee with the Haxtun Steam Heater Company in 1876. At this time, in his evolution he reached the stage of bookkeeper and general utility man.

The next four years were years of development and expansion, as the Haxtun Steam Heater Company was, in 1880, employing 120 men, an increase of 243% over 1876. In 1883, Mr. Baker's name was first mentioned in an official capacity, as having been elected a director of the company. At this time the moving spirits were: W. E. Haxtun, J. H. Pierce, E. E. Baker, N. D. Bailey and Horton Vail. Subsequently Mr. Vail became the vice-president and shop superintendent of the Kewanee Boiler Company, in which dual capacity he acted to the time of his death in 1902.

The Company Begins Quantity Production

In 1882 the foundry had risen to the requirements of two molding machines and daily heats of 23,000 lbs. of iron were melted, as compared with the 2600 lb. heat which was the first taken off in 1876. The significance of the growth of the foundry simply emphasizes the increase of the boiler business, the foundry being only an auxiliary to the boiler shop, as no castings were made by the company except as parts for the equipment and appurtenances of steel products. At the annual meeting in 1883, it is reported that the company sales for the previous five years had ranged from $63,000 in 1878, to $386,000 in 1882; this latter amount shows an increase of $323,000 over the sales of 1871, by the Anderson Heater Company.

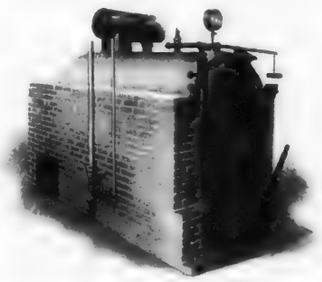
During 1882, M. F. Moore, present manager of the Kewanee Boiler Company came into the employment of the Haxtun Steam Heater Company where, as an industrious office boy, he began to acquire the training and experience which stands him in hand today as a capable and efficient vice president in charge of production.

In 1883, the plant consisted of the following buildings:

Boiler Shop	60 ft. x 124 ft.
Machine shop	60 ft. x 192 ft.
Iron foundry	50 ft. x 100 ft.
Brass foundry	50 ft. x 60 ft.
Total	26,960 sq. ft. of space

or six times more than that covered by the Anderson Steamer and Heater Company shop in 1871.

B. F. Baker, vice-president and treasurer of the Kewanee Boiler Company, came to Kewanee in 1883. He was engaged in the banking business until 1889, in which year he entered the employ of the Haxtun Steam Heater Company. In the latter part of 1883, the Kewanee Rolling and Pipe Mills Company was added to the plant, and we find that the old one-horse-power horse of 1868, and the 40 H.P. engine of 1871,



Kewanee Brickset Updraft Boiler, 1892

had been supplanted by engines of 1000 H.P., the plant then covering an aggregate area of 1½ acres. The Kewanee Rolling and Pipe Mills Company and the Haxtun Steam Heater Company were consolidated under the latter name in 1884. On January 1, 1888, the pipe mills were destroyed by fire, but by prompt action and strenuous efforts displayed by the pioneers of the company the new mills were in operation in the early part of the same year.

The shop payroll for 1888 was $412,000, which is a considerable contrast with the Kewanee Boiler Company payroll of nearly $2,000,000 in 1927.

In March, 1891, the name of the Haxtun Steam Heater Company was discontinued and the name Western Tube Company adopted. E. E. Baker became vice-president, treasurer and a director of this company. In the spring of 1892, the Western Tube Company decided to discontinue the manufacture of boilers and other boiler-shop products. It was in May of that year that the Kewanee Boiler Company was organized; the ownership and financial interests of this company have ever been entirely separate and apart from those of the parent company, that company having continued its career under the name of The National Tube Company and is at the present time the Walworth Mfg. Company.

On the initiative of E. E. Baker, the Kewanee Boiler Company was organized and incorporated May 4, 1892, with a capital stock of $100,000. The first directors were: E. E. Baker, Horton Vail, T. P. Pierce, August Wagner and J. P. Dugger. The first officers were: E. E. Baker, president and treasurer; Horton Vail, vice-president; J. P. Dugger, secretary. During 1892, B. F. Baker joined the company and was made treasurer. Since the death of Horton Vail, in 1902, B. F. Baker has officiated in the dual capacity of vice-president and treasurer. The growing needs of the business necessarily increased the official personnel.

The business of the Kewanee Boiler Company was begun in the old boiler shop of the Western Tube Company. In 1893, the company built an addition to the boiler shop on Main Street, which now is the west end of the Walworth

Kewanee Boiler Works

plant; with this addition the boiler shops occupied about 1½ acres and employed something less than 100 men. In 1900, the Kewanee Boiler Company sold this property to the Western Tube Company and purchased 7 acres—part of its present site—then erected new shops. A cast-iron radiator foundry was added to the plant in 1902 and it has, by normal growth, assumed proportions second to only one other in the world.

During 1906, there began, in some of the principal cities of the United States, serious consideration and studious investigations of the evils resulting from smoke, such as emitted from chimneys and smoke stacks of public, industrial, commercial and residential buildings. Especially in sections of the country where bituminous coals are natural and convenient fuel supply, the abatement and prevention of smoke had become a matter of grave importance, as affecting the public's health and the public's purse and comfort. It was only a step forward for this company to apply a down-draft grate in the furnace of their boiler to make the already popular Kewanee a smokeless boiler, and this boiler has been developed and improved until today it is recognized as one of the outstanding contributions of the engineer in the campaign for the elimination of smoke.

In September, 1927, the Kewanee Boiler Corporation was merged with the American Radiator Company. Since that time a $200,000 addition, 80 ft. x 745 ft. has been built for handling the new welded boiler brought out by this company. The plant now occupies 33 acres and employs 1200 men.

Standard Text on Steam-Fitting

The apprenticeship service department of the Plumbing and Heating Industries Bureau has published a "Standard Text on Steam-fitting" for steam-fitter apprentices and those interested in the elements of steam-fitting, and steam and water heating.

In the first few chapters an outline is given of the advantages of entering the steam-fitting trade, the necessity for co-operation with fellow steam-fitters, and employers, the importance of satisfying the customer and the value of performing one's duties carefully. A description of the tools used by steam-fitters, and information as to their use, are taken up in some detail.

An explanation of the operation of various kinds of traps, expansion loops, valves and other fittings and appliances, used in the steam-fitting trade, is then presented in simple and easily understood language. Round and sectional boilers are shown in cutaway views and the text takes up the fundamentals of the design of these boilers. Oil and gas burners are described with special references to the piping involved in their installation. Direct and indirect cast-iron radiation, concealed radiators, and pipe coils are illustrated and described. The effect of painting radiators and the result of putting radiators in enclosures are also taken up. Thermostatic-control appliances are described with special reference to the information needed by the steam-fitters for their installation.

Starting with Group 4 in the text book, the measuring, cutting, threading, reaming and making-up of pipe, is described and well illustrated. Following this the various methods of setting boilers, connecting valves and fittings are explained. The installation of various kinds of heating systems is taken up in detail so that the apprentices will have every opportunity to learn how to make all kinds of connections, rough in the piping, and erect all the accessories, such as radiators for various types of installations.

Starting with Group 5, elementary mechanical drawing is taken up, special attention being paid to the laying out of heating systems; the conventional symbols are shown and instructions given on how to make detailed drawings of boiler connections. Following this, the layout of the different kinds of heating systems, such as air-line systems, vapor systems, closed water systems, and vacuum systems are shown together with their detailed connections so that the apprentice can learn how to make a complete layout of these installations on paper before beginning the job.

This text book should act as a handbook to the steam-fitting trade.

Various methods of computing heat losses from buildings are described with particular attention paid to the Heating and Piping Contractors National Association radiation estimating sheets; heat-loss coefficients for various types of walls, floors, and roofs are given, and the last part of the book is devoted to elementary physics and chemistry so far as they concern the steam-fitter. The book closes with a short description of the commonly-used systems for humidifying, dehumidifying and washing of air.

The authors of this book have produced an outstanding piece of literature in this field. It can be read with profit not only by apprentices but by steam-fitters and engineers. The information presented is unusually clear and to the point.

Size 5½ in. x 8½ in., Pp. 432; Published by the Plumbing and Heating Industries Bureau, Chicago, Ill., or can be obtained through the book department of THE HEATING AND VENTILATING MAGAZINE. Price $5, bound in cloth.

American Public Health Association Holds Annual Meeting

The fiftieth annual meeting of the American Public Health Association was held at the Hotel Stevens in Chicago, October 15-19. Among the sessions was a symposium on schoolroom ventilation at which reports on schoolroom ventilation studies were made by Leonard Greenburg, of Yale University, covering his studies at New Haven, Conn.; by Lyman W. Childs, supervisor of health service, Board of Education, Cleveland, who reported on the progress being made in that city; by H. J. Shaughnessy, department of hygiene, University of Chicago, who told of the work being done in the Chicago suburbs, and by Thomas J. Duffield, executive secretary, New York Commission on Ventilation, New York, who described the work carried on in connection with the schoolroom ventilation study in Syracuse, N. Y.

A. C. Willard, president of the American Society of Heating and Ventilating Engineers, gave a talk in which he stated that he hoped the heating and ventilating engineers and the Public Health Association were cooperating in every sense of the word and that any disagreements which may have existed in the past had been forgotten. An address by Dr. C.-E. A. Winslow, of Yale University, was followed by a general discussion.

Bituminous Coal Conference

Hundreds of scientists will attend the Second International Conference on Bituminous Coal to be held at the Carnegie Institute of Technology, Pittsburgh, Pa., November 19-24. Among these will be more than twenty of Germany's foremost scientists and engineers who are identified with the latest discoveries in the use of bituminous coal and its by-products.

It has been announced that representatives in Germany will participate prominently in the discussion of the use of pulverized fuel, gas production, liquefaction of coal, fixation of nitrogen, low temperature distillation and boiler fuel and coal washing.

From preliminary indications, it is pointed out that Germany will have the largest number of delegates and speakers among the eighteen or more nations to be represented at the conference. France, England and Canada will have comparatively large delegations. Other countries that will have at least one representative or delegate include Italy, Austria, Belgium, Chile, Czecho-Slovakia, Denmark, Japan, Norway, Jugoslavia, Roumania, Poland, Spain and Russia.

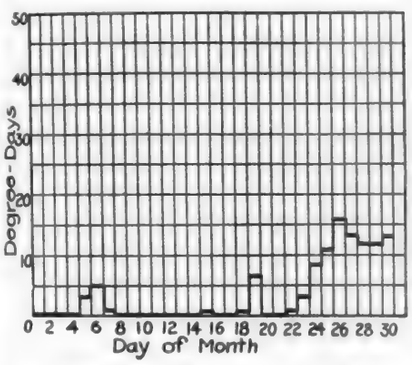
Monthly Heating Load in Degree-Days in Six Typical Cities

STARTING in 1927, THE HEATING AND VENTILATING MAGAZINE published the heating loads in degree-days for five cities. This was continued throughout the heating season, and met with such enthusiastic response that it will be continued this year with the addition of one other city—Minneapolis.

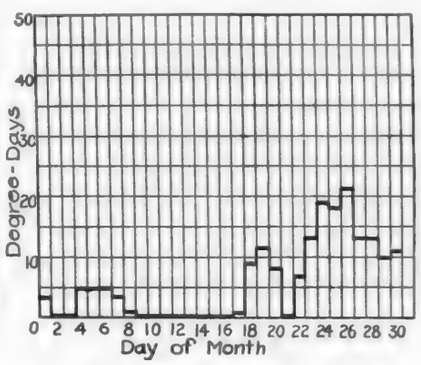
As explained in the December, 1927, issue, these graphs can be pasted together so that, at the end of the season, the annual heating load is shown in such a form that the distribution of heat demand during the different months can be seen at a glance. At the bottom of this page is a reproduction of the assembly of these charts for the 1927-28 season for New York City. Such a presentation of this material is of particular value to heating contractors, oil-burner salesmen, commercial managers of gas companies, and others who are interested in fuel consumption.

For the benefit of those readers who have not had occasion to use the degree-day, the following explanation will be of value. The degree-day is the product of one day in time and a temperature difference of 1°. The number of degree-days per day is the difference between the average outside temperature and 65° when the outside temperature is below 65°. Thus when the average outside temperature is 50° for a certain day, the number of degree-days heat demand for the day is 15. If the outside temperature is 12°, there are 53 degree-days in that day. The number of degree-days is thus seen to be a direct indication of the heat demand, and consequently of the fuel consumption.

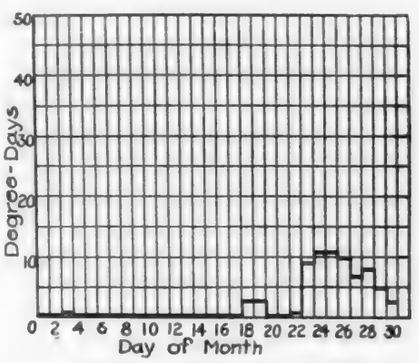
The use of the degree-day and charts to be used in connection with fuel consumption are explained in the Iso-Degree-Day Chart and the Iso-Coal-Consumption, Iso-Oil-Consumption and Iso-Gas Charts, by P. E. Fansler, published by The Heating and Ventilating Magazine. Price $1.



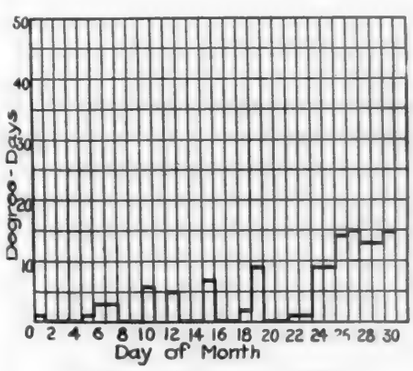
New York, September, 1928
Degree-Days 107—Degree-Days to Date 107



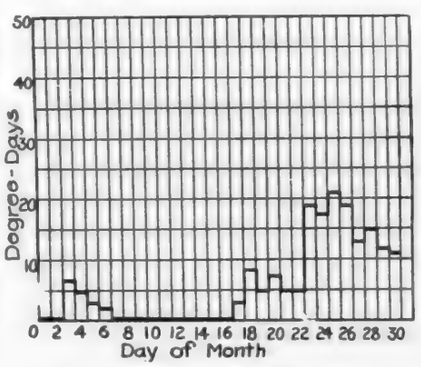
Pittsburgh, September, 1928
Degree-Days 177—Degree-Days to Date 177



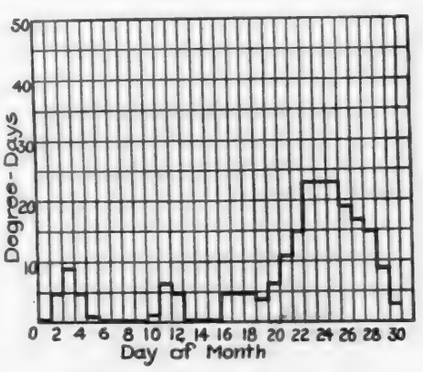
St. Louis, September, 1928
Degree-Days 72—Degree-Days to Date 72



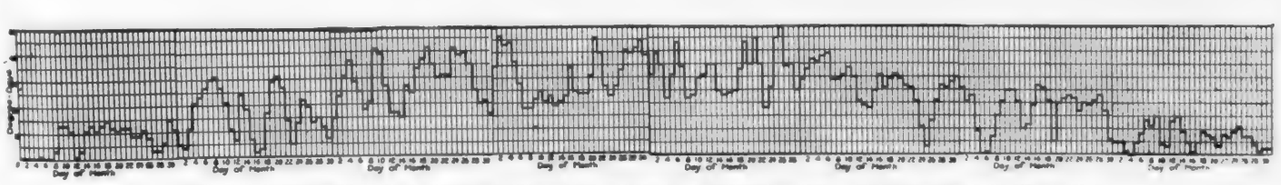
Boston, September, 1928
Degree-Days 127—Degree-Days to Date 127



Chicago, September, 1928
Degree-Days 177—Degree-Days to Date 177



Minneapolis, September, 1928
Degree-Days 217—Degree-Days to Date 217



How the Monthly Degree-Day Charts for New York Were Pasted Together to Form a Continuous and Graphic Picture of the 1927-8 Heating Season Load

American Society of Heating and Ventilating Engineers

Annual Open House of the Research Laboratory

The Research Laboratory held its third annual open house October 1. This event has become an occasion for bringing together a number of technical committees and others allied with the society, and among the committees which held their meetings at this time were the research committee, the council of the society, the committee on rating of low-pressure heating boilers, the heat transmission division of the national Research Council, the committee on standard method of determining heat loss from buildings, and the standardization committee of the Heating and Piping Contractors National Association.

The open house and the first fall meeting of the Pittsburgh Chapter were held in the evening of the same date and many out-of-town visitors attended. At this meeting, which was, perhaps, unique in the number of prominent national figures present, a number of visitors were called upon to talk on the various society activities in which they were interested.

Members of the Pittsburgh Chapter, out-of-town guests and friends of the laboratory were invited to see the various research activities under way. Visitors were taken through the laboratory in groups and were shown the work that is being done.

Some of the investigations include the study of capacity of pipe sizes for steam heating systems at the laboratory of the Carnegie Institute of Technology. This involves the study of return pipe sizes for gravity and vacuum systems. An investigation is being made on infiltration concerned with the leakage of air through stucco walls. The visitors were interested in data accumulated during the past few years on leakage of air through brick and frame walls.

A demonstration of the work at the laboratory with the use of the Nicholls heat-flow-meter in the determination of heat loss through various types of building construction was of interest to those present. This subject lends itself to a popular demonstration of the problems at the laboratory. One of the meters was shown in such a way that the galvanometer spotlight could be chased back and forth across the scale by applying one's hand to either side of the meter.

Considerable interest was shown in the change in conductivity of concrete wall due to aging. The work at the laboratory with the heat meter bears out the claims of heating contractors that the conductivity of concrete varies greatly during the first year. Further study will indicate how much change takes place during succeeding years. A recent application of the Nicholls heat-flow meter by the laboratory is that of measuring more accurately surface transmission coefficients for both the inside and outside of typical walls.

Atmospheric conditions and their relation to health and comfort has been a popular subject and attracted the interest of those inspecting the laboratory. The present work of the laboratory in determining the rate of heat and moisture loss from the human body and its effect in ventilation, particularly in cooling theatres in summers, especially interested those engaged in ventilation work.

During the day the council held a meeting with the following members present: A. C. Willard, president; Thornton Lewis, first vice-president; L. A. Harding, second vice-president; A. V. Hutchison, secretary; H. H. Angus, W. H. Carrier, H. Lee, J. F. McIntire, H. Lee Moore, F. B. Rowley. S. R. Lewis, chairman of the committee on research, and C. F. Eveleth also attended the council meeting.

The research committee held its annual meeting with the following members present: S. R. Lewis, chairman; W. H. Carrier, S. E. Dibble, Philip Drinker, C. F. Eveleth, H. P. Grant, L. A. Harding, F. C. Houghten, F. D. Mensing, W. A. Rowe, F. B. Rowley and A. C. Willard.

At a meeting of the committee on rating of low-pressure heating boilers the following persons were present: L. A. Harding, F. C. Houghten, S. R. Lewis, A. C. Willard.

At this time the heat transmission division of the National Research Council also held a meeting for the purpose of developing a standard code for determining the conductivity of building material. Those attending this meeting

Some of the Guests at the Research Laboratory Open House, on the Steps of the Bureau of Mines, Pittsburgh, October, 1.

were: W. H. Carrier, chairman of the heat transmission division; W. V. A. Kemp, secretary; L. B. McMillan, chairman of the sub-committee on developing a code of practice for determing the conductivity of building materials; and the following members of the committee: F. C. Houghten, director of the Research Laboratory; R. H. Heilman, Mellon Institute of Industrial Research, Pittsburgh; Prof. A. P. Kratz, University of Illinois; Dr. M. S. Van Dusen, of the U. S. Bureau of Standards, Washington; E. R. Williams; Prof. F. B. Rowley, of the University of Minnesota, and E. C. Lloyd, Armstrong Cork Co., Pittsburgh.

The committee on a standard method of determining heat loss from buildings is a correlating committee fostered by the society and on which a number of representatives of allied organizations are serving. There were present at their meeting on this occasion: F. B. Rowley, chairman; F. C. Houghten, representing the society; W. H. Carrier, of the *Guide* publication committee; A. P. Kratz, W. A. Rowe of the National Association of Fan Manufacturers; John Holton of the Industrial Unit Heater Association; R. S. Franklin of the standardization committee of the Heating and Piping Contractors National Association; C. G. Segeler, American Gas Association; C. M. Lyman, National Warm-Air Heating Association; W. W. Stevenson, National District Heating Association and J. C. Fitts of the Heating and Piping Contractors National Association.

The standardization committee of the Heating and Piping Contractors National Association met in Pittsburgh with J. C. Fitts, secretary; R. S. Franklin, chairman; and W. R. Rhoton, C. G. Lamb and R. A. Wolff present.

Harding Elected Chairman of Research Committee

Seeking to provide for continuity in the functioning of the research committee, S. R. Lewis arranged to have the election of the chairman take place at the laboratory open house, rather than at the annual meeting of the society in mid-winter. By adopting this course, the incoming chairman has an opportunity to thoroughly familiarize himself with the policies and activities of the committee so that when he takes office there will be no delay.

Acting on this premise, the far-sighted secretary announced, with his usual smile, that the chairmanship of this committee was no cinch; that it called for hard work and personal sacrifice; that it was a real job of such importance that no member, selected as the logical leader, could plead any excuse for declining to serve. He then delivered the ultimatum that a ballot would be taken in the committee, each member voting for the person best qualified as chairman, and that the result would be accepted without question or declination.

The balloting disclosed that L. A. Harding was the majority choice and he was declared elected. Accepting, in a whimsical talk, Mr. Harding voiced his appreciation of the outstanding accomplishments of Mr. Lewis and said that he would have great difficulty in keeping the pace that had been set. The selection of Mr. Harding was a happy one and augurs well for the continuation of committee activities along well defined and progressive lines.

Michigan Chapter

The October meeting of the Detroit chapter was held on the 15th with 55 members and guests present. The guest speaker was R. S. Hawley, professor of mechanical engineering, University of Michigan, who described the activities of the university in connection with extension work. He stated that classes in heating and ventilating engineering, sponsored by the extension department at the Detroit Engineering Society club house, had 120 men enrolled.

President Rowe told of progress in certified heating in other cities, and Edward Harrigan related personal experiences in this activity in Cleveland, St. Louis, Memphis and Chicago.

Boiler Rating Code Committee Work Progresses

The committee on rating and selection of low-pressure heating boilers through its chairman, Alfred Kellogg, Boston, addressed a communication to the president and the council of the A.S.H. & V.E., Sept. 27, in which was summarized the history of the committee's work and in which was expressed the hope for definite action by the council in preparing a statement of instructions to the committee which would guide it in its future work of preparing a boiler rating code for the society, and for the protection of heating contractors and users of low-pressure heating boilers.

At the meeting held in Pittsburgh, October 1, the council considered the communication of Mr. Kellogg's committee and unanimously authorized the committee to continue its work under the following procedure:

1. That the society's committee known as the committee on rating and selection of low-pressure heating boilers is to submit a report to the council at its meeting in New York December 6, which is to cover the output determination of low-pressure, solid fuel, steam heating boilers without covering selection, load determination or chimneys and that the committee's name in the future is to be known as the committee on rating low-pressure heating boilers.

That the boiler rating code requested, is to embody the best judgment of the committee, in the light of the West Baden and other discussions, of what will constitute the most workable code. Copies of the report are to be in the hands of the council three weeks in advance of the meeting in New York, December 6.

2. That the committee is to cooperate with the committee on code of minimum requirements for the heating and ventilation of buildings to see that there is mutual coordination of the work.

3. That the committee is to revise the existing code for testing low-pressure heating boilers of the society so that it shall be in agreement with the new boiler rating code.

4. That the committee's sub-committee on load determination shall cooperate with the committee on code of minimum requirements for the heating and ventilation of buildings to achieve coordination of its work after which it is to be discharged.

5. That the committee's sub-committee on chimneys is to be discharged and its function is to be fulfilled by the committee on code of minimum requirements for the heating and ventilation of buildings.

6. That the committee may submit any alternative form of code which it may desire and this will carefully be considered by the council.

7. That these instructions do not restrict the activities of the committee in securing all practical cooperation from other interested organizations and individuals.

8. That the council has appropriated an additional fund not to exceed $500 for the necessary expenses of the committee during the remainder of the fiscal year.

Air Delivery from Unit Heaters to Be Studied

The Research Laboratory of the American Society of Heating and Ventilating Engineers will undertake a study of the methods used for measuring the amount of air delivered by unit heaters. This will be done at the request of joint committees of the Research Laboratory and the Unit Heater Manufacturers Association, both of which are looking toward a rapid completion of the code for testing unit heaters. The tolerance-limit of variation between the results obtained by Pitot-tube determination and those obtained by temperature-rise computation will be determined in these tests.

New Data in 1929 Guide

The *Guide* publication committee has announced that the 1929 *Guide* will contain over 800 pages, nearly 100 more than the previous edition. There will be 33 chapters in the book, five more than in the last edition, on subjects which have not before been treated in the *Guide*. Among the new chapters will be those on chimneys, fan-furnace heating, central heating systems, heat exchangers for water and oil, design and operating data for Treating Department buildings, and selection of fans for ventilation and drying.

The complete table of contents will be as follows:

Preface
Code of Etics
Table of Contents
Index to Technical Data
Introduction

Part I—Heating

Heat Losses from Buildings
Radiators and Heaters
Steam Heating Systems and Piping
Hot-Water Heating Systems and Piping
Heating Boilers
Chimneys
Mechanical Draft
Gravity Warm-Air Furnace Heating
Fan Furnace Heating
Heating and Conditioning with Air
Central Heating Systems
Greenhouse Heating Systems
Domestic and Industrial Oil Heating
Heating with Gas
Heat Insulation for Pipes and Surfaces
Automatic Heat Control
Heat Exchangers for Water and Oil
Pumps and Traps for Heating and Ventilating Equipment
Kitchen, Laundry and Hospital Equipment and Piping Systems
Water Supply Systems and Piping for Buildings
Pipe, Fittings and Valves
Design and Operating Data for Treasury Department Buildings

Part II—Ventilation

Modern Standards and Physiological Effects of Ventilation
Systems of Ventilation
Air Conditioning and Cooling
Selection of Fans for Ventilation, Drying
Motive Power and Controls for Fans
Design and Construction of Air Ducts
Air Cleaners
Ozone in Ventilation
Methods of Drying
Dust, Exhaust and Collecting System
Natural Ventilation
Catalog Data Section
Index to Modern Equipment
Roll of Membership

Nominations for Research Committee

The nominating committee has submitted the following list of nominees for members of the committee on research for 1929: O. W. Armspach, A. P. Kratz, A. E. Stacey, R. S. Franklin and F. E. Giesecke.

New York Chapter Holds First Meeting

The New York Chapter held its first meeting of the winter at the Building Trades Club, October 15.

An address had been arranged by Dexter J. Purinton on the "West Street Telephone Building," but due to illness Mr. Purinton was unable to attend. A. S. Armagnac, who was chairman of the meetings committee, asked that representatives of the manufacturing companies shou'd give short talks telling what new products their companies were bringing out. It was felt that the heating and ventilating industry has made such strides that such news would be extremely interesting.

Representatives of the York Heating and Ventilating Corp., Sarco Co., Pacific Steel Boilers Corp., Nash Engineering Co., American Radiator Co., Jenkins Co., Hoffman Specialty Co., the Trane Co., American Blower Co., National Tube Co., Carrier Engineering Corp., McDonnell & Miller, and Skinner Bros. Mfg. Co., gave short resumes of the latest activities of their companies, and the new products that have just been brought out, or are about to be announced.

Illinois Chapter Opens Winter Season

The first meeting of the season of the Illinois chapter was held at the Hotel Sherman, Chicago, October 8. The annual report of Secretary Thomas was read and approved, and an analysis showed that during the past season the membership was increased to 176, 16 new members were added, 12 dropped, and the average attendance was 93.

The speaker of the evening was Harry L. Fogleman, vice-president of the Sheldon School, who addressed the meeting on the subject of "The Engineer; Should He Be a Salesman?" One of the points brought out by Mr. Fogleman was that "one-fourth is in what you say and three-fourths is in *how* you say it."

The officers elected for the coming year are: president, H. G. Thomas; vice-president, T. H. Monaghan; secretary, C. W. Deland; treasurer, August Kehm. Newly elected members of the board of governors are: J. H. O'Brien, R. B. Hayward and E. P. Heckel.

President Heckel, in introducing the new officers, spoke in a highly complimentary way of the work of Secretary Thomas during the past year, and as a token of fellowship and gratitude for his long service, presented Mr. Thomas, on behalf of the chapter, with a beautiful watch.

Library Ventilation to Be Investigated

Recent difficulty in the Library of Congress resulted in a conference held at the United States Bureau of Standards in Washington, D. C., September 28. A knowledge of the proper temperature, humidity and air motion for library stack rooms necessary to keep the books and papers well preserved is an important subject and one on which little information is available. Some difficulty has been experienced in large libraries due to the dryness of the air, and, in some, there also has been trouble with mold, due to an excess of moisture.

At the conference a committee was appointed as follows: Dr. H. C. Dickinson; W. E. Emily; E. F. Mueller; H. L. Dryden, and R. H. Heald of the Bureau of Standards staff under the authority of Dr. George K. Burgess, director of the Bureau; William C. Bond, superintendent of the Library of Congress; H. M. Lydneberg and J. H. Fedeler of the New York Public Library; Angus McDonald, and Samuel R. Lewis, chairman of the research committee of the A.S.H. & V.E.

A commission was organized and established working arrangements and adopted two general plans as follows:

(1) Studies and records of the actual conditions in the Library of Congress will be instituted, especially to develop specific improvements there.

(2) Studies at the United States Bureau of Standards will be undertaken to define the effect on new books of various atmospheric conditions, taking into consideration various kinds of paper used in the books, and possibly including studies of the behavior of various kinds of bindings.

It is expected that the United States Bureau of Standards and the Library of Congress will carry on the actual work of research, but the A.S.H. & V.E. Research Laboratory will participate and assist in these studies which are expected to extend over a year.

1928 Record Year for U. S. Exports

On the basis of the first nine months' figures for this year, American export trade is larger in volume than in any previous year and larger in value than in any year since 1921, according to report of the National Foreign Trade Council issued recently.

Of the $3,563,000,000 worth of exports reported up to the end of September, 73% represents goods wholly or partly manufactured. One-fifth of these manufactured goods goes to Latin-America, where we now are selling more than our three leading competitors, England, France and Germany, combined.

GAS REQUIREMENTS FOR AVERAGE INSTALLATIONS

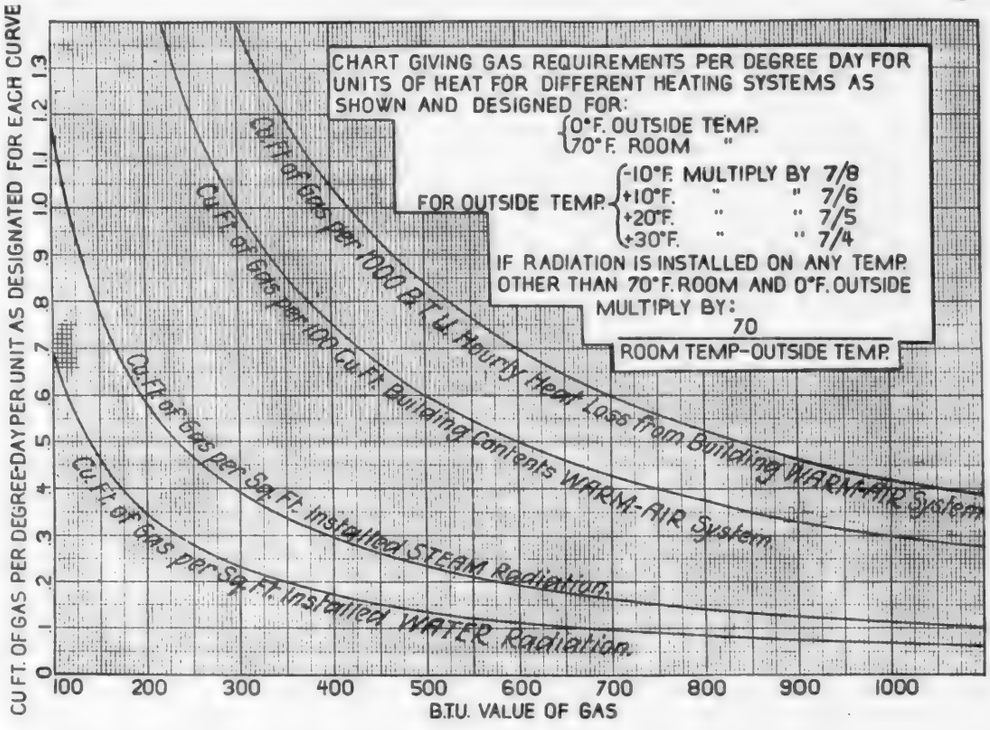


CHART GIVING GAS REQUIREMENTS PER DEGREE DAY FOR UNITS OF HEAT FOR DIFFERENT HEATING SYSTEMS AS SHOWN AND DESIGNED FOR:
0°F. OUTSIDE TEMP.
70°F. ROOM "
FOR OUTSIDE TEMP.
-10°F. MULTIPLY BY 7/8
+10°F. " " 7/6
+20°F. " " 7/5
+30°F. " " 7/4
IF RADIATION IS INSTALLED ON ANY TEMP. OTHER THAN 70°F. ROOM AND 0°F. OUTSIDE MULTIPLY BY:
70
ROOM TEMP-OUTSIDE TEMP.
Cu. Ft. of Gas per 1000 B.T.U. Hourly Heat Loss from Building WARM-AIR System
Cu. Ft. of Gas per 100 Cu. Ft. Building Contents WARM-AIR System
Cu. Ft. of Gas per Sq. Ft. Installed STEAM Radiation
Cu. Ft. of Gas per Sq. Ft. Installed WATER Radiation
CU. FT. OF GAS PER DEGREE-DAY PER UNIT AS DESIGNATED FOR EACH CURVE
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3
100 200 300 400 500 600 700 800 900 1000
B.T.U. VALUE OF GAS

From "House Heating," published by American Gas Association.

GAS HEATING—Gas Requirements for Average Installations | No. 50-A

DIMENSIONS FOR DRAFT DIVERTERS FOR GAS-BURNING APPLIANCES

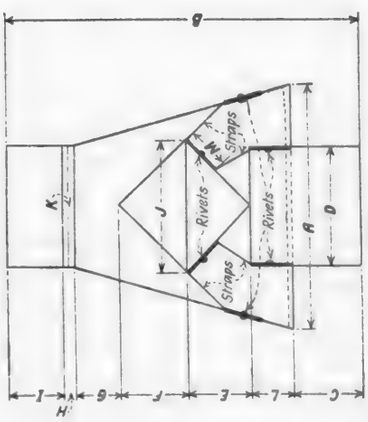
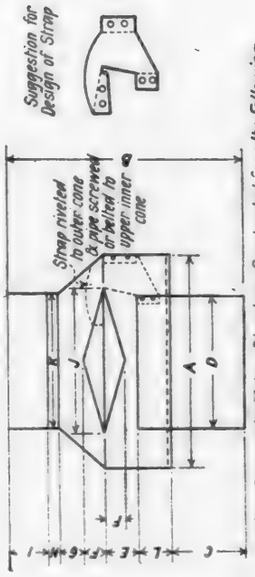


Table of Dimensions

BACK DRAFT DIVERTER FOR SMALL GAS-BURNING APPLIANCES

Size of Pipe	A	B	C	D	E	F	G	H	I	J	K	L	M
3	6	8¾	1¾	3	1¾	1¾	1	¼	1⅛	3¼	3	1	1
4	8	12	2⅜	4	2⅜	2⅜	1⅜	⅜	1¾	4¼	4	1⅜	1⅜
5	10		3	5	3	3	1⅝	½	2	5½	5	1⅝	1⅝



Manufacturers Note: *Diverters Constructed from the following Dimensions should have the Inner Cones Supported by Vertical Straps*

Table of Dimensions

BACK DRAFT DIVERTER FOR LARGE GAS-BURNING APPLIANCES

Size of Pipe	A	B	C	D	E	F	G	H	I	J	K	L	No. of Straps
6	9½	10⅜	3½	6	1½	1	1⅜	⅜	1¾	6½	6	1½	4
7	11⅛	12⅛	4⅛	7	1¾	1⅜	1⅜	½	2	7⅝	7	1¾	6
8	12⅝	14⅜	4⅝	8	2	1⅜	1⅜	½	2⅛	8¾	8	2	6
9	14¼	16¼	5⅛	9	2¼	1½	1⅝	⅝	2½	9¾	9	2¼	6
10	15⅝	17⅝	5⅝	10	2½	1⅝	1⅝	⅝	2⅝	10⅝	10	2½	6
11	17⅜	19¾	6⅜	11	2¾	1⅞	2⅛	¾	3	12	11	2¾	6
12	19	21½	7	12	3	2	2½	¾	3⅛	13	12	3	6
13	20⅝	23⅝	7⅝	13	3⅛	2⅛	2⅝	⅞	3½	14	13	3¼	6
14	22⅛	25	8⅛	14	3½	2⅜	2⅞	⅞	3¾	15	14	3½	6
15	23¾	26⅞	8¾	15	3¾	2½	3⅛	1	4	16	15	3¾	6
16	25⅜	28⅛	9⅜	16	4	2⅝	3⅜	1	4½	17	16	4	6

From "House Heating," published by American Gas Association.

GAS HEATING—Dimensions for Draft Diverters | No. 50

The Heating and Ventilating Magazine's Data Sheets Nos. 50 and 50-A

The Cost of Comfort

AN important and well-written publication has just been issued by the National Lumber Manufacturers Association, Washington, D. C. The title is "The Cost of Comfort," and it is one of a series of books published by the association on lumber and its utilization—a handbook on the economics of dwelling insulation.

Insulation, as the book brings out, reduces heat losses and its use makes possible the installation of a smaller heating plant than otherwise would be required. Costly fuel is saved. On the other hand, as the authors state, "..... while fuel economy can be accomplished by various forms of special wall construction, the additional fixed charges resultant in an increased cost of the structure may much more than offset the fuel saving involved; from an economic viewpoint, at least, the simpler types of dwelling construction often are the more satisfactory."

The authors present their data by listing the various popular types of wall, roof and floor construction, both insulated and uninsulated, and give detailed calculations covering the cost of the wall, amount of radiation necessary, fixed charges on the heating plant, and fuel charges per year, the total being the "cost of comfort" for that particular type of construction.

As an example, the first type of wall construction shown in the book consists of plaster, wood lath, studding, sheathing, building paper, and bevel siding. The quantity of each of these materials needed for 100 sq. ft. of this wall is shown, together with the unit cost. Labor on the 100 sq. ft. is divided into carpenter's time, lather's time, and so on, including the helpers and foreman, and the total of the material and labor costs represents the cost of this type of wall per 100 sq. ft. Since the average house will require 2000 sq. ft. of wall, the costs and fixed charges then are calculated for 2000 sq. ft. of wall. The interest on the cost of the wall is added to the fixed charges on the heating plant and the cost of coal required per year, the total being the annual charges.

The authors have developed an interesting table on the hour-degrees of temperature difference between interior and exterior of dwellings in representative cities throughout the country. In the first column the average temperature between October 1 and May 1 is given for the cities listed. Column 2 shows the average temperature for the "waking hours," and equals (70°—column 1). Column 3 is the average temperature for the sleeping hours, and equals (60°—column 1). Seven hours is allowed for sleeping and the remainder is termed waking hours. Multiplying the number of waking hours by the average temperature during those hours, and following the same idea through for the sleeping period, the total number of hour-degrees for the heating season is aggregated. It is unfortunate that the authors did not see fit to use the degree-day instead of their so-called hour-degrees, as the bases for both systems are nearly the same.

Heat loss co-efficients are taken from the A.S.H. & V.E. *Guide*. Heat-loss calculations are made on the basis of a maximum temperature difference of 80°, and the cost of the water heating system is estimated at $1 per square foot. Multiplying the cost per square foot by the temperature difference, the area (2000 sq. ft.), and the heat loss coefficient, and dividing by the factor 150 (emission per square foot), the cost of the heating plant is secured. Fuel costs are calculated by multiplying the heat loss coefficient by the area, and by the number of hour-degrees per season, taken as 163,000 for the problems worked out, and the whole divided by 6000 (the useful heat in a pound of coal at 50% efficiency) and by 2000 (the pounds of coal per ton); the result is multiplied by fuel cost, taken as $12 per ton, the product being the fuel cost per season.

Using this method of calculation, the authors show the costs of the various types of construction. The essential function of the publication is to show that insulation does not necessarily pay the home-owner. However, taking a standard type of construction, plaster, wood lath, studs, sheathing, paper and bevel siding, as shown in Type 1 in the book and comparing it with the same construction insulated with, say, Flaxli-num (Type 12 in the book), it is found that the annual cost of the latter construction for 2000 sq. ft. is $113.01 as against an annual cost for the uninsulated wall of $143.50. Using this as an example, it appears that the authors have failed to prove their point; instead it seems that insulation does pay.

As is brought out in the book, only about 25% to 35% of the heat loss takes place through the walls, and the rest of the heat is lost through the roof, through the glass, and around the windows and doors. It is obvious, therefore, that wall construction is only one factor in the comfort and fuel economy of a dwelling, and that the most effective wall construction may be defeated in its purpose by inadequate roof construction and loosely fitting windows and doors.

The depreciation allowed on the heating system—2%—is too low. A heating system 50 years old is indeed a rarity, and examples are so few that it seems far fetched to base depreciation on a life of 50 years. In comparing the uninsulated and insulated types of construction, the low depreciation tends to make the percentage of saving by the use of insulation less than is obtained if a shorter life is assumed for the system. Individual copies of the book are furnished gratis by the National Lumber Manufacturers Association, Transportation Bldg., Washington, D. C.

Red Cross Roll Call For 1928

The personnel of the heating and ventilating field in New York City again this year is co-operating actively with the American Red Cross in its roll call membership appeal which opens Armistice Day. Henry B. Gombers, secretary of the Heating and Piping Contractors National Association, heads the activities as volunteer chairman of the special heating, piping and refrigeration contractors group and will follow essentially the same plan of effort which brought such generous response in 1927.

This group is one of approximately 175 now being formed as part of the committee organizations in New York City. Each group, industrial, mercantile or professional will be directed by a representative leader in that field, many of whom, like Mr. Gombers, have already served in the same capacity in earlier roll calls.

More than 3345 disabled veterans, men still in service and dependents, received Red Cross service during the year in New York. Employment was found for 674 crippled and otherwise disabled veterans.

Annual Meeting of A.S.M.E.

Among the papers to be read at the annual A.S.M.E. meeting in New York, December 3-7, will be "Air Conditioning in the Printing and Lithographing Industries," by W. H. Carrier and R. T. Williams. Charles H. Cochrane is preparing a paper "Heat Drying Equipment for Printing Presses." The progress report of the executive committee on boiler feed water studies will be presented at this time and includes "Zeolite Softeners Internal Treatment, Priming and Foaming," Sub-Committee No. 3, C. W. Foulk; "Standard Methods of Water Analysis," Sub Committee No. 8, H. Farmer, and "Bibliography of Boiler-Feed Water Studies," Sub-Committee No. 9, George A. Stetson.

Finance Corporation Expands

A branch office of the Heating and Plumbing Finance Corporation has been opened at 816 South Michigan Ave., Chicago, with R. L. Brentlinger as manager. Mr. Brentlinger, who formerly was with the Chicago branch of the American Radiator Company is well known in the trade in the Chicago district.

The Chicago branch, for the present, will handle all transactions, formerly handled in the following branch offices of the American Radiator Company: Indianapolis, Chicago, Milwaukee, Omaha, St. Paul, Kansas City, Denver, San Francisco, Seattle, Detroit, St. Louis, Cleveland and Cincinnati.

Buffalo Forge Celebrates Fiftieth Anniversary

The fiftieth anniversary of the Buffalo Forge Company was celebrated at the annual three-day sales convention of the Buffalo Forge Company, Buffalo Steam Pump Company and the Canadian Blower and Forge Company, Ltd., held recently at Buffalo, N. Y. Representatives of more than forty branch offices of these companies took active part in a notable convention. Representatives were also present from the South American and Porto Rican offices.

The first day was spent in renewing acquaintances, discussing past meetings and visiting the factory. On the second day a golf tournament was won by Jack De Visser of the Detroit office. The driving contest was won by E. E. Johnson of the Buffalo office. On the third day, two business sessions were held in which the salesmen discussed the business of the past year and made plans for the 1929 season.

Ventilation Commission Carries on Work in Syracuse

A continuation of the work of the New York Commission on Ventilation is being carried on in Syracuse for the purpose of determining the effects on the pupils resulting from the use of different types of heating and ventilating systems.

This work, which is under the direction of Miss Margaret Ingels, of Lexington, Ky., was begun October 8. In four of the schools, fans draw in air from the outdoors and the air then is put through heating coils and blown into the classrooms. Exhaust fans on the roof are used to draw out the used air, and the rooms are heated by radiators.

In four other schools the fan-gravity system is installed, gravity flues being used to carry the air to the roof.

Window ventilation with deflectors and heaters near the windows, and exhaust fans on the roof, is used in two of the schools, while gravity systems are in use at three other schools.

Observations are being made in the classrooms to determine the amounts of air being circulated, heat distribution, air currents at the desk level, and the dust content of the air. Teachers and nurses are assisting in the survey by keeping close watch on the health of the pupils, recording data as to the number of pupils who show signs of respiratory illness. In order to determine whether the rate of air change is responsible for respiratory illness in the schools, adjacent rooms will be observed, in the one 10 cu. ft. of air being supplied per pupil per minute, and in the other 30 cu. ft. per minute. This will be done in all the schools, regardless of the type of ventilating system. For two rooms being operated under the same conditions, except that one is being supplied with 30 cu. ft. of air and the other 10 cu. ft., the same nurse will observe the effects in both rooms, so that the personal equation will be reduced to a minimum.

A. O. B. A. and Oil Heating Institute Move Their Offices

The American Oil Burner Association and the Oil Heating Institute, under the direction of Trell W. Yocum as managing director and secretary-treasurer, are located in their new headquarters on the sixteenth floor of the Canadian Pacific Building at 342 Madison Avenue, New York.

Meeting of the Chicago Oil Burner Association

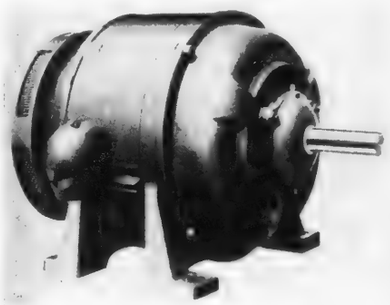
Forty members and guests attended the regular monthly meeting of the Chicago Oil Burner Association at the Allerton House, October 9. No outside feature was on the program and the meeting was given over to a discussion of conditions affecting oil-burner distribution in the Chicago territory and other confidential matters.

Executives and Employees of the Buffalo Forge Company at the Fiftieth Anniversary and Sales Convention

New Apparatus and Appliances

Fully-Enclosed Fan-Cooled Induction Motor

A line of enclosed fan-cooled induction motors for use where motors are exposed to dirt, iron dust, or moisture, has been



Reliance Fully-Enclosed Induction Motor

brought out by the Reliance Electric & Engineering Co., Cleveland, O. This motor overcomes any objection of excess weight and size by using the principles of ventilation and enclosure, which make it possible to obtain the full open rating of a fully-enclosed motor. Two kinds of construction are used, one for the smaller sizes built in riveted-type frames, and another for the larger sizes built in skeleton-type frames.

In the first type, internal fans are used to circulate the air around the coil heads where a large part of the heat is generated. This causes the internal heat to be transmitted to radiating bonnets which entirely surround the coil heads and seal the motor against the entrance of dirt.

Across the outside surface of these radiating bonnets a strong blast of air is blown which absorbs the heat from the bonnets and carries it away from the motor into the surrounding atmosphere. This current of cooling air also passes across the outside of the stator core.

The outside blast of air is produced by large radial fans, one at each end of the motor shaft just outside the bonnet. The external fans are surrounded and protected by standard bearing brackets such as are used on an ordinary induction motor. In the skeleton-frame type motor, a single exhaust-type fan is mounted on an extension of the shaft, outside the front bearing bracket. External cooling air is drawn in through openings at the center of the back bearing bracket and the air passes over the radiating bonnets and stator and is exhausted at the front end.

Among the advantages of the enclosed-type motor is protection of motor winding against dirt and moisture, protection of air gaps against clogging, and elimination of fire hazard from motors where the atmosphere is filled with inflammable dust. The riveted-frame motors are interchangeable in all mounting and limiting dimensions with the standard open motors of the same size.

Arcoflash Heating Unit

A jacketed round boiler has been announced by the American Radiator Co., New York, as the Arcoflash heating unit. This boiler is covered with a metal jacket finished with red enamel and lined with 1-in. asbestoscel. A two-way smokehood is provided so that the smoke-pipe can be taken off vertically or horizontally. These boilers have large grate area and fuel-carrying capacity to insure long firing periods, and the reversed flue travel is designed to give a quick heating response. Available in either steam or water types, these boilers are supplied in four sizes with steam ratings from 375 sq. ft. to 750 sq. ft. of radiation and grate areas from 1.77 sq. ft. to 3.14 sq. ft. They are completely equipped for automatic regulation and necessary accessories.

Arcoflash Jacketed Round Boiler

Type TZ Paint-Spraying Outfit

DeVilbiss Type TZ Paint-Spraying Outfit

A paint-spraying outfit, which includes the advantages of being low-priced and at the same time giving a reasonable efficiency and insuring satisfactory results in the hands of an untrained user, is announced by the DeVilbiss Co., Toledo, O. The Type TZ outfit, which sells for $8, will successfully handle all the modern lacquers, as well as paints, varnishes, enamels, stains, shellacs and bronzes, and it is of particular interest to small contractors who use paint-spraying machines in painting the new types of radiation.

The combination hand-pump and air reservoir operates easily with one hand, and enough air pressure is stored in the reservoir to provide a steady uniform flow of air through the gun. The glass container for the material is easily attached and detached. For convenience, various kinds and colors of materials can be kept in extra glass containers with covers, ready for instant use. The gun is so devised that ordinary pint-size fruit jars with screw tops can be used for this purpose.

Time-O-Stat Automatic Temperature Controls

Mechanical simplicity is the feature of a line of low-voltage temperature controls announced by the Time-O-Stat Corp., Milwaukee, Wis. The temperature regulator is finished either in silver plate or statuary bronze. A snap-action contact blade used in the regulator af-

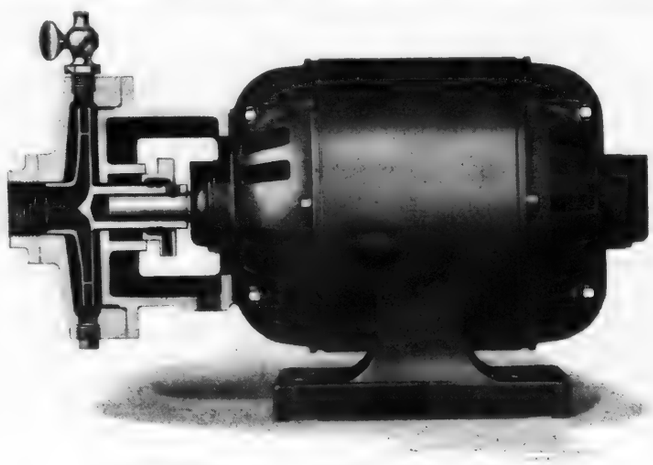
fords a clean make-and-break of the circuit, and minimizes the possibility of arcing and corrosion. A Seth Thomas eight-day clock and a Tycos thermometer are used. The electric-motor control is a General Electric product, and is of low-voltage type, which obviates the necessity of running the wires in conduit. Operating on twenty volts, the motor has a manually-controlled switch which permits opening and closing the draft and check from the basement, if desired. Limit controls for steam, vapor, hot-water and warm-air systems are also included in the line of controls.

Model "M" Electric Furnace Man

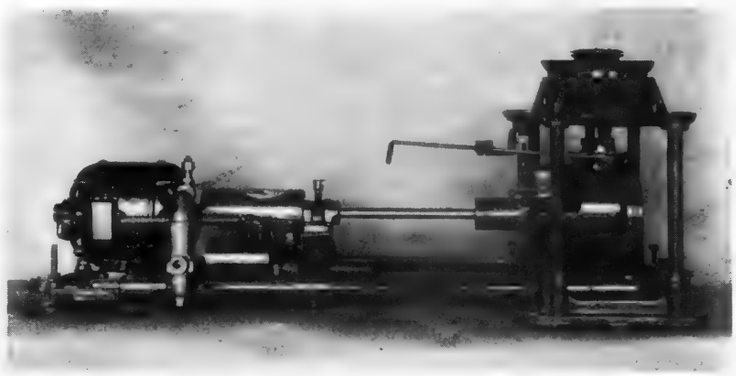
The Domestic Stoker Co., 7 Dey St., New York, has developed a new Electric Furnace Man to take care of heating plants too large for the H2R model and too small for the twin model stoker. In its mechanical construction, Model M is the same as the H2R except that it is 10 in. longer and it has larger burner diameter dimensions. The burner diameter has a minimum dimension of 15⅝ in. with an extension ring of 19 in. The inside clearance of boiler should not be less than 26 in. A 500-lb. hopper is provided with a maximum feed of 29.4 lbs. of No. 1 Buckwheat. The capacity of this stoker is 850 sq. ft. of steam or 1200 sq. ft. of water.

Improved Line of Trane Centrifugal Pumps

Increased capacities, higher efficiencies, and more compact units are claimed for the new line of centrifugal pumps recently placed on the market by The Trane Co., La Crosse, Wis. Designed for simplicity of installation and maintenance, these pumps have bearing housings fitted with a double row of New Departure ball bearings. Alignment of the motor and pump is assured by connecting the pump directly to the motor end-plate by a bracket cast integral with the head of the pump. Bronze is used for all the fittings, while the shafts are of high-carbon steel. Completely assembled and ready to connect, these pumps are sold with the switch box, and motor protective equipment mounted with the pump as a single unit. These units are available with capacities up to 500 gal. per min., and for pressures up to 225 lbs.



Trane Direct-Connected Centrifugal Pump



Hardinge Junior Oil Burner

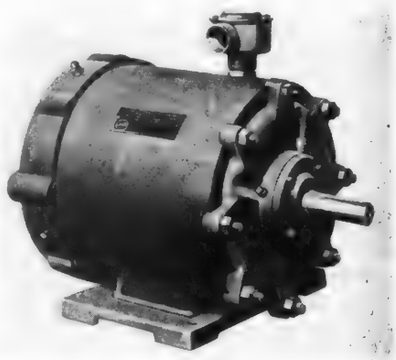
Hardinge Junior Oil Burner

A new junior burner to sell at a price to reach prospects of modest income has been announced by Hardinge Bros., Inc., Chicago. This machine, a replica of the Hardinge Model 0, Combination 1, which formerly was the lowest priced machine of the company, is stripped of the sump bucket, drip bucket, mercury safety-switch and levers, oil valve, gas valve, governor, and pump bracket. This leaves the essentials of the Hardinge burner, the head assembly, motor and straight-drive shaft.

The oil valve will be assembled with the machine, and the gas control equipment will be mounted with the Con-Tac-Tor lockswitch on a wall panel. The stack control, which is furnished with the burner, will be installed in the stack and connected with the lockswitch. Also a Con-Tac-Tor No. 135 thermoswitch will be furnished with each machine. The new machine already has been advertised to sell at $385, installed without tanks.

Self-Ventilated Explosion-Proof Motor

A self-ventilated explosion-proof motor which will be known as type EX is announced by the Louis Allis Co., Milwaukee, Wis. This motor has been tested, inspected and listed by the Underwriters' Laboratories for operation where gasoline, naphtha, oil or other petroleum products are made, used, or handled.

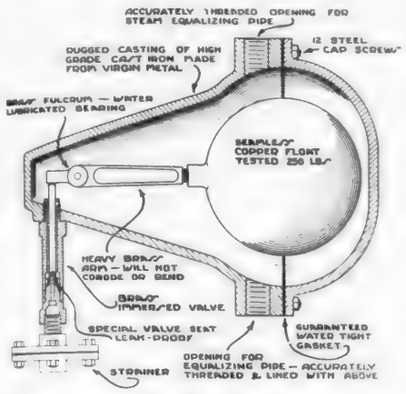


Self-Ventilated Explosion-Proof Motor

This motor is approximately half the weight of an unventilated motor and slightly heavier than a standard open motor. A 5 H.P., 1750 R.P.M. type EX motor, for instance, is only 33 lbs. heavier than an open motor of the same rating, and it can be installed in the same space. The new motor will eliminate the need of installing motors in outside rooms; of extending line shafts and belts through walls, ceilings, or floors: or of piping to an external air supply for motor ventilation. It will eliminate also the danger of explosions from sparks due to belt static. It is available for alternating current in sizes up to 10 H.P.

Combination Feed-Water Regulator and Fuel Cut-Off

The McKee combination feed-water regulator and low-water fuel cut-off for gas-fired boilers has been announced by the Eclipse Fuel Engineering Co., Rockford, Ill. This device automatically will


ACCURATELY THREADED OPENING FOR STEAM EQUALIZING PIPE
DUGGED CASTING OF HIGH GRADE CAST IRON MADE FROM VIRGIN METAL
12 STEEL CAP SCREWS
BRASS FULCRUM — WATER LUBRICATED BEARING
SEAMLESS COPPER FLOAT TESTED 250 LBS.
HEAVY BRASS ARM — WILL NOT CORRODE OR BEND
BRASS IMMERSED VALVE
SPECIAL VALVE SEAT LEAK-PROOF
GUARANTEED WATER TIGHT GASKET
STRAINER
OPENING FOR EQUALIZING PIPE — ACCURATELY THREADED & LINED WITH ABOVE

Section of McKee Feed-Water Regulator

supply new make-up water in the boiler, where the city water pressure is greater than the operating pressure in the boiler. In case the water-level in the boiler falls to an exceptionally low point, due to freezing or clogging of the water lines or to reduction of the city water pressure a lever, which connects to the gas valve, is dropped, closing the valve, so that the fire in the boiler is extinguished and danger of burning the boiler eliminated. Another attachment to the regulator, supplied as an option, is an immersed valve. Feed-water containing lime will precipitate lime when it mixes with the hot water in the boiler. The deposit usually taking place in the water regulator. When this lime adheres to the valve seat it causes the valve to leak, flooding the boiler. The immersion valve is designed to prevent this by causing the cold water to pass the valve seat before it mixes with the hot water. McKee combination regulator and fuel cut-off is available in 6 sizes, with or without the immersion valve.

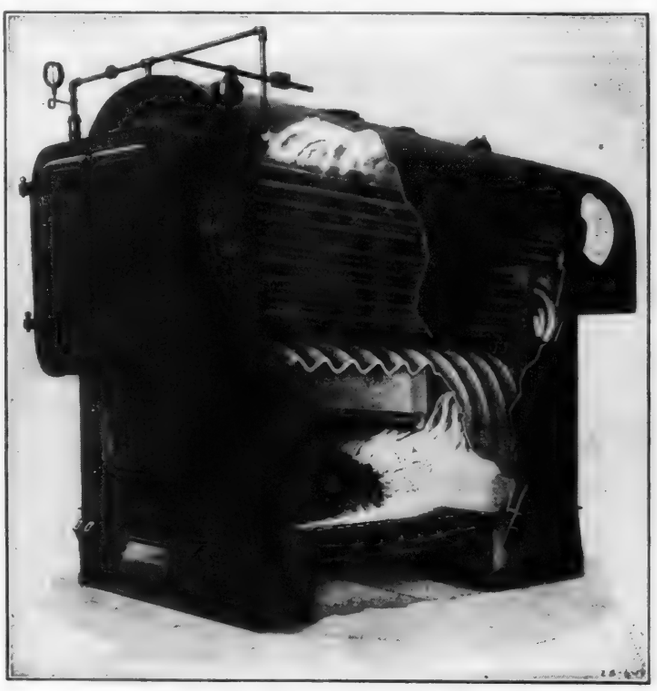
Kewanee Boiler with Corrugated Firebox

An electric-welded steel heating boiler, similar to the Scotch marine-type boiler used in the power field, is announced by the Kewanee Boiler Corp., Kewanee, Ill. It is to be known as the Type C smokeless, and is available in both coal and oil-burning types. The firebox, which is semi-circular in cross-section, has a water-edged refractory arch. After passing through the combustion chamber in the rear of the arch, the gases enter the fire-tubes, making two passes before they leave the boiler. In the oil-burning type the arch is omitted, the back being protected by brick; in case it is desired to put the oil-burner in from the back, the brick are placed in the front. Corrugations in the firebox increase the heating surface and also give it greater strength to resist the steam pressure. Expansion and contraction also are taken up by these corrugations. Coal-burning boilers in the Type C are available in capacities from 2300 to 32,000 sq. ft. of radiation; in the oil-burning boiler the range is 2800 to 36,000 sq. ft.

Pittsburg-Gallaher Gas-Fired Boiler

A gas-fired boiler has been introduced recently to the trade under the name of the Pittsburg-Gallaher boiler by the Pittsburg Water Heater Co., Pittsburgh, Pa. The sections are made up of triangular-shaped water-tubes nested in a horizontal plane, with the space between them so arranged as to afford direct travel through the boiler; the tubes are staggered, one above the other, so that the heat, in passing through the boiler, entirely surrounds them. In each section there are five tubes, the two lower ones and the bottom of the center tube sloping in one direction, while the top of the center tube and the two upper tubes slope in the opposite direction. The purpose of this design is to cause the water to pass back and forth through the tubes, instead of allowing it to short-circuit up through the vertical tubes. Water-jacketed sides have convex projections on the inside which extend into the space between the tubes to such an extent that the gases are forced to scrub either the sides or the tubes. Cast-iron burners run longitudinally from front to rear. An insulated jacket with a Duco finish covers the boiler, the front being removable so that the boiler can be opened for inspection and cleaning. Snap valves or motor valves can be supplied, thermostatic pilot control also being optional; all types are furnished with the usual accessories, including a gas-pressure regulator. A.G.A. ratings of these boilers range from 330 sq. ft. to 6987 sq. ft. of steam radiation.

Pittsburg-Gallaher Gas-Fired Boiler



Kewanee Type C Smokeless Boiler with Corrugated Firebox

Oil Burners for Large Low-Pressure Heating Plants

Low Pressure, Atomizing Type, Manual Ignition and Control

Previous articles in this series are:

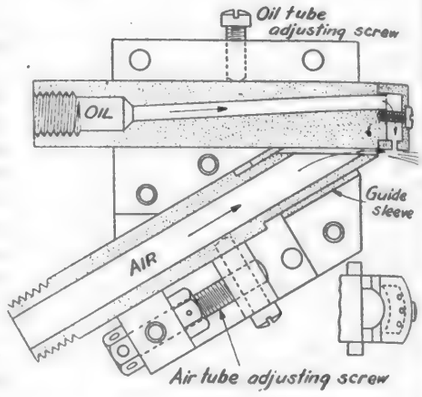
1. *Todd*, August, 1927.
2. *W. N. Best*, September, 1927.
3. *Ballard*, October, 1927.
4. *Ray*, November, 1927.
5. *Johnson*, December, 1927.
6. *Petro*, January, 1928.
7. *Winslow*, June, 1928.
8. *Simplex*, September, 1928.

9. Vesta.

THE Vesta fuel oil-burning system has been on the market for the past six years, and is manufactured by the J. S. & J. F. String Co., Inc., Newark, N. J., whose efforts have been confined to Connecticut, New York and New Jersey territories. In October of this year, a new company was formed to manufacture and sell the Vesta system, with a new day-light factory, located at 92-94 Sunswick St., Long Island City, N. Y., and known as the Vesta Manufacturing Company. This company is beginning a national distribution.

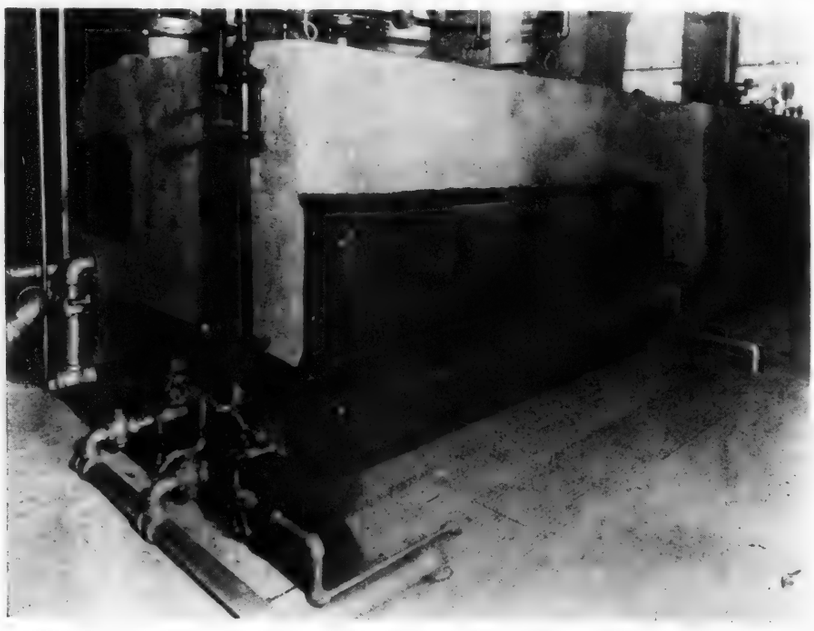
Burners are available in a comprehensive range from the requirements of a small stove to the heating plants of the largest buildings. They have been in use for many years prior to the time when oil came into such general use for heating homes and apartments; this equipment was developed for and used extensively in manufacturing plants in connection with heat processes, such as the melting, heat treating and tempering of metals, drying and baking various materials, generating process steam, brick making, etc. For these purposes the burners were applied to forges, furnaces, ovens, retorts, boilers, kilns, etc.

Vesta equipment, as built for industrial service, is equally well suited for application to the heating boilers in the larger types of buildings where severe requirements prevail. The Vesta System is of the low-pressure atomizing type. Oil and air are supplied to the burner nozzles from motor-driven pump- and blower-units. Burners are of the external mixing type; that is, the oil and air do not mingle until after discharge from their respective orifices. The directions of flow of the oil and air at the time of their discharge are at right angles to one another. The air, as it is released through its orifices, expands and attains a relatively high velocity in a horizontal direction, meets the issuing oil and projects it in the form of a fog or mist into the furnace. The type of flame thus produced is fan shaped and the spread is varied to suit the shape of the combustion chamber. By utilizing the full cross-section area of the chamber in this way, full burner ratings are developed without concentrating destructively high local heats. This method of utilization of the entire combustion chambers of particularly wide and short boilers is augmented further by installing the burners in multiple. In such a case the burners are mounted on the boilers so that the projected mist enters the combustion chamber through a special venturi-shaped ignition chamber of refractory material. This chamber aids ignition and guides the gas to the main combustion chamber where it burns in complete suspension.

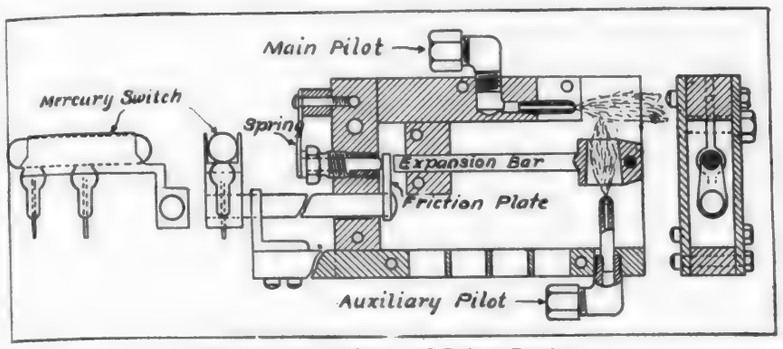


Section of Vesta Nozzle

The amount of air issuing from the burner is controlled by a slotted revolving drum which is integral with the nozzle. As this slot forms the orifice, the energy developed by the blower is available in the form of air velocity at the point where the air and oil intermix. The drum is rotated by a hand wheel and after the proper opening is determined an adjustable sleeve may be set and the opening always maintained. The oil passage in the burner is large and free from any constricted openings or tortuous channels and all oil will drain from the burner as soon as the supply is cut off. The simplicity of this design, the absence of any moving parts, and the rugged construction prevent trouble by the elimination of trouble-making parts. Flow of oil to the burner is controlled by a metering valve, in-



Typical Installation of Vesta Burners in the Large Low-Pressure Heating Plant of the Nathan Hale School, New Haven, Conn.



Detail of Gas Pilots and Safety Device

stalled in the supply pipe at a convenient place near the burner.

The boiler combustion chambers are lined with fire brick from the floor to the grate line. The grates are removed and a checkered floor of brick is laid several inches above the bottom. Air is admitted to this lower space through controlled ports. It absorbs considerable heat and passes through the openings in the checker floor to the combustion chamber where it unites with the atomized oil to form a completely combustible gas. The normal stack draft is sufficient to induce this air into the combustion chamber. Consequently, the sizes of blower and motor are small, as only the amount of air required to atomize the oil is handled by the blower. Assembled on a single bed plate, the blower, pump, and motors are so arranged that the power to drive the pump is transmitted from the blower shaft, the motor being connected to the blower. By this arrangement any failure of the blower to operate automatically stops the flow of oil. A forced-feed oiling system lubricates the blower. Excess oil is separated from the discharged air and flows back to the lubricating oil reservoir.

Pumping units are made in a number of sizes and a selection may be made to obtain that most economical for each installation. They may be installed singly or in duplicate so that one unit may be kept in reserve. This method of building up a plant by units makes it very flexible and adaptable to future changes or additions to the boiler plant.

The Vesta system lends itself to automatic control. This may be complete or semi-automatic. In the semi-automatic system, which is generally more suitable for the larger plants, the rate of oil flow to the burners is governed by the boiler pressure.

In the design of the auxiliary equipment, the same care and attention to detail have been given as in the burner and pumping units. The Vesta pneumatic oil shutoff is of special interest. The valve is operated by means of a plunger in an air cylinder and is of the revolving type. The disc and seat have ground surfaces which are always in sliding contact with each other. No dirt or foreign matter can lodge between them to prevent their closing tightly nor can the valve ever be jammed shut so tight that it will fail to open. The oil metering valve embodies the same principle as the pneumatic valve with the additional feature of a very fine adjustment for controlling the flow of oil. There are no converging passages in these valves, hence no variation of flow. Stuffing boxes are unusually deep and are provided with glands as required by the Underwriters' regulations.

Vesta burners are made in 12 sizes, rated as follows:

No.	Capacity Sq. Ft. Steam Radiation	
1	1,000	
2	2,400	
3	3,200	
4	5,500	with double nozzle
5	8,000	with double nozzle
6	12,000	with two double nozzles
7	16,000	with two double nozzles
8	24,000	with necessary noz. assem.
9	30,000	with necessary noz. assem.
10	40,000	with necessary noz. assem.
11	50,000	with necessary noz. assem.
12	60,000	with necessary noz. assem.

These units will operate with any zero test oil, or from 12° A. P. I. up. They are furnished to operate under full manual, semi-automatic or full automatic control.

Nozzle of Vesta Commercial Type Burner

Use of Insulation Increases

The use of rigid insulating board by building contractors is increasing rapidly, according to a survey conducted by the Department of Research in Lumber Retailing at Antioch College, in conjunction with the Ohio Retail Lumber Dealers Association. Data collected by this department show that the use of rigid insulating board, such as Celotex, Maftex, Masonite and Insulite, together with other similar types used as sheathing, increased 144% between the beginning of 1925 and the end of 1927. The survey indicates a still further increase during 1928.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE HEATING AND VENTILATING MAGAZINE, published monthly at New York, N. Y., for October 1, 1928.

State of New York, County of New York, ss.:

Before me, a notary public in and for the state and county aforesaid, personally appeared Arthur S. Armagnac, who, having been duly sworn, according to law, deposes and says that he is the editor of The Heating and Ventilating Magazine, and that the following is to the best of his knowledge and belief, a true statement of ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act August 24, 1912, embodied in Section 411, Postal Laws and Regulations, printed on the reverse of this form to wit:

1. That the names and addresses of the publishers, editor, managing editor, and business managers are:

Publisher, Heating and Ventilating Magazine Co., 386 Fourth Ave., New York, N. Y.

Editor, Arthur S. Armagnac, 386 Fourth Ave., New York, N. Y.

Managing Editor, None.

Business Manager, Gustave Petersen, 386 Fourth Ave., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given).

Heating and Ventilating Magazine Co., 386 Fourth Ave., New York, N. Y.

Arthur S. Armagnac, 386 Fourth Ave., New York, N. Y.

Gustave Petersen, 386 Fourth Ave., New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more or total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain, not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bonafide owner and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

ARTHUR S. ARMAGNAC, Editor.

Sworn to and subscribed before me this 20th day of September, 1928.

F. A. JOHNSON,
Notary Public.
(Commission expires March 30, 1930.)
New York County Clerk's No. 46.
New York Co. Register's No. 0-8.

New Trade Publications

Warco Valves is the subject of a folder sent out by W. A. Russe'l & Co., Grand Central Terminal, New York. This folder describes the complete line of Warco radiator and vent valves, and special attention is paid to the Warco No. 2 vacuum valve for radiators. A line drawing of this valve, together with a description of its mechanical features, is presented.

Ross Steel Boilers for Apartment Heat are described in an attractive catalog issued by the Frost Mfg. Co., Galesburg, Ill. Diagrammatic views of Ross steel boilers are shown, and ten construction features of this heater are presented, together with a detailed description of the structural arrangement. Special attention is paid to the use of oil burners in connection with this boiler. Specifications which include capacity and dimension tables also are presented. Photographs of apartment houses in which these boilers have been installed are shown in the back of the book.

The Dunham Handbook No. 414 is the latest edition of a handy manual issued by the C. A. Dunham Co., Chicago, Ill., for engineers and fitters. This edition gives special attention to the Dunham Differential vacuum heating system which is explained in detail by means of graphs and drawings of typical instal'ations showing piping connections, etc. The Dunham vacuum return-line system and the Dunham vapor system are both described and illustrated in a very complete manner. Typical layouts and boiler and piping connections are shown in detail, and altogether this handbook is the most interesting and valuable of any that has been issued by this company. Practically all the material contained is of real value to a layout man or engineer who is seeking information about any of the Dunham systems or their layouts, as little or no "sales talk" is included. The engineering data presented in the back are up-to-the-minute, and include such subjects of interest as building insulation, the effect of radiator enclosures, standard drafting symbols in the heating and ventilating industry, etc. Size 4 in. x 7 in., pp. 270.

Horton Variable Speed Pulleys are the subject of several circulars received from the Horton Mfg. Co., Minneapolis, Minn. This pulley is capable of giving any number of revolutions between belted speeds and 50% to 75% reduction therefrom without the usual stepping-down process.

The principle of this pulley is a spring tension, governor-controlled self-releasing clutch and loose pulley designed to attain and hold a desired speed. A slight movement of the control handle causes the friction blocks in the clutch to engage gradually with the belted loose pulley, imparting power to the shaft of the driven machine gradually until it rotates at the desired speed. Any fluctuation in the speed of the power, or driving, pulley automatically is neutralized by the centrifugal action of the governor weights so that the Horton (the driven pulley) maintains uniform speed regardless of any fluctuations in the speed of the power, or driving, pulley. This pulley is used successfully in many branches of industry and is especially interesting as a speed-control device for use with ventilating fans, conveyors, etc.

New Vistas for Gas Service Executives, a booklet issued by the Columbus Heating and Ventilating Co., 423 West Town St., Columbus, O., is designed to sell gas company executives on the use of Columbus gas furnaces for house heating. It is a four-page booklet printed in bronze and black ink and bound in double, heavy paper covers.

The Handbook on House Heating also issued by this company contains sections on the measurement of heat, heat loss through building materials, wall stacks, return air ducts, location of furnace and registers, construction of furnace and chimneys, humidity, and numerous tables giving data on general aspects of warm-air heating and the Columbus equipment. Another booklet contains general information on the construction of the burners and pictures of homes in which these units have been installed. Size 9 in. x 6 in. Pp. 27. A folder in red and black announces that these furnaces are being sold in territories served by both natural and manufactured gas. A cutaway view of the furnace shows details of construction and the travel of flue gases through the furnace.

A Match Does the Trick, announces the Automatic Gas-Steam Radiator Co., 301 Brushton Ave., Pittsburgh, Pa., on a folder recently distributed to the trade. This folder, together with two smaller ones and a handbook, give specifications for a number of different sizes of automatic gas-heated steam radiators the company manufactures. The handbook, besides giving general information on the subject of heating buildings, contains rules for figuring radiation and radiator sizes that should be installed. Cuts of heating systems show how the automatic radiators can be used in connection with heating plants of one and two-pipe systems.

The Raymond Duo-Stat is the caption appearing on a circular received from the F. I. Raymond Co., 228 North La Salle Street, Chicago, Ill. Reproductions are shown of graphs made in a six-room home in which a simple thermostat control was installed. Graphs from the same house are shown when under the Raymond automatic dual control. The purpose of the graph is to show that a more even room temperature is maintained using the Raymond control and that less overheating and temperature lag occurred when using this method of control than when using a simple thermostat control. Photographs of some of the homes using Raymond controls are shown on the back of the circular.

Evenheat Automatic Draft Regulator and Fuel Saver is the title of a circular published by Carl O. Staley & Co., Congress Park, Ill. This device, which fits in a "T" connected to the smoke pipe, is so designed that it automatically will maintain the same draft regardless of outside changes in weather conditions. A balancing weight is adjusted to open and close automatically with any variations in draft.

The Heating Season Is Here is the title of a broadside issued by the C'eveland Gas Burner & Appliance Co., Cleveland, Ohio. An outline of the comforts, convenience and cleanliness of gas-heating systems leads up to a description of the advantages of the Barber burner, which can be installed in either round or sectional boilers and furnaces. A description also is given of the demonstrating outfit supplied at a special price by this company to its dealers.

Talks by Luther D. Lovekin on the subject of protection of domestic water heaters have been published in six pamph'ets by the Schutte & Koerting Co., Philadelphia, Pa. Among the subjects covered are water meter troubles and their remedy, protection for the home, the Lovekin temperature controlled safety valve for gas water heaters, the Lovekin combined temperature and pressure relief valve for coal-fired water heaters, and a suggestion to adopt temperature control for domestic hot water boilers.

Do You Believe in Signs appears on the cover of a circular received from Robbins, Gamwell & Co., Pittsfield, Mass., telling of the Rogaco portable electric pipe machine. A reply card is included with this circular for those who wish for detailed information.

SENIOR · HIGH · SCHOOL · · PAWTUCKET · R.I.

MONAHAN & MEIKLE, *Architects and Engineers*, Pawtucket, R. I. — H. L. GRAHAM & SONS, INC., *Heating Contractors*, Pawtucket, R. I.

QUALITY

was THE MAIN CONSIDERATION *hence* POWERS TEMPERATURE CONTROL

WAS THE SYSTEM SELECTED

WHY ARE POWERS THERMOSTATS BETTER?

BECAUSE THEY—

1. Need *no annual adjustment or overhauling.*
2. Have *no fine restrictions* to become clogged by dirt.
3. Are no larger than others, but *thermostatic element is larger*— therefore more sensitive and powerful.

THE POWERS REGULATOR COMPANY

35 Years of Specialization in Temperature Control

CHICAGO: 2718 Greenview Avenue NEW YORK CITY: 137 East 46th Street

Offices in 35 Other Cities

The Canadian Powers Regulator Company, Toronto, Ontario

(4189)

POWERS

Bryan Oil and Gas-Fired Boilers are featured in a circular received from the Bryan Steam Corporation, Peru, Ind. Designed exclusively for oil or gas burning, these boilers contain a large number of copper tubes nested closely together, giving a large area of heating surface. These tubes are sloped upwards, so that circulation is aided. A domestic hot-water coil of four passes is provided for attachment to tank connections, and is so designed that it is entirely separate from the other tubes; it is to be used on steam installations, and if the demand for domestic hot-water is heavy, one of the coils can be placed in the front and another in the back of the boiler. Steam boiler ratings run from 500 sq. ft. to 3200 sq. ft. of radiation.

Announcing the Gray Sentry, a folder received from the Central Radiator Co., Lansdale, Pa., describes the jacketed boiler made by this company. The finish is in French gray enamel, which is said not to show dust, and the boiler is insulated with rock-wool. The top of the boiler slopes to each side slightly so as to do away with the severe box-like appearance. The inside of front and back sections, as well as the sides and surface over the fire, are corrugated. Two types of grates are available, one for large sizes of coal, the other for No. 1 buckwheat, the boiler being designed to burn hard or soft coal or coke. It is available in two widths, 15 in. and 22 in., the ratings being from 500 sq. ft. to 2050 sq. ft. of steam radiation.

More Than a Product . . . the mark of a Service is the title of a folder published by the Webster Electric Co., Racine, Wis., featuring the Webster ignition transformer. Every part of this transformer is designed and built by the Webster company, so that service is simplified. It can be furnished with either single or double high-tension terminals for a variety of voltages and frequencies. Photographs of various departments of the factory are shown, as well as a photograph of the transformer.

Shaw-Perkins High-Convection Radiators are the subject of a folder just issued by Shaw-Perkins Mfg. Co., Pittsburgh, Pa. Illustrations are presented of these radiators installed in both horizontal and vertical positions, replacing pipe coils in factories, as well as a phantom view of the radiator in a recess under a window in a residence. A ceiling-type radiator of special design also is included in this line of convection radiation.

Is A Saving of 30 to 50% Worth While? is the question asked on the cover of a booklet published by the Newport Boiler Co., Chicago. Designed for the consumer, the booklet takes up the importance of the heating plant and describes how revertible flues reduce the amount of heat lost up the chimney. The ability of this boiler to burn No. 1 buckwheat coal is the basis for the statement that 30% to 50% of fuel costs can be saved, based on egg anthracite, while the magazine feed makes it possible to fire the boiler only once a day to twice a week, depending on the weather.

National Multi-Flow Tank Heaters are described and illustrated in a display-sheet sent out by The National Pipe Bending Co., New Haven, Conn. In this heater, which is covered with a red

National Red-Jacketed Tank Heater

enameled jacket, a fire-brick combustion chamber is used to eliminate cooling of the fire and cracked firepots due to the sudden inrush of cold water. Copper coils form the indirect heating surface, the coils having a high coefficient of conductivity and being capable of withstanding pressures of 600 lbs. per sq. in.

Iron Fireman Forced Underfiring is the subject of an attractive and cleverly illustrated booklet for building owners issued by the Iron Fireman Mfg. Co., Portland, Ore. The advantages of underfeed and mechanical draft are explained by text and colored illustrations, this being followed by photographs of typical installations in all types of buildings. Structural details of the stoker are shown in a large cutaway view, and the thermostatic and limit controls used in connection with the Iron Fireman are described. The use of the junior model of this device in connection with domestic installations is outlined, followed by letters of endorsement, making the booklet of interest and value to homeowners. Size 8½ in. x 11 in. Pp. 16.

The Fire That Burns Uphill is the title on a modernistic cover of a consumers' booklet presenting the story of solid fuels and their relation to the Spencer magazine-type heater, manufactured by the Spencer Heater Co., Williamsport, Pa. The importance of a properly-kept fire is emphasized in the text preceding a complete and unusually well-illustrated description of the different kinds of solid fuel. Small sizes of coal and coke are recommended for the Spencer Gable-Grate, colored drawings of which are accompanied by an explanation of why and how this grate can burn these small-sized fuels. The part played by this company's heater in connection with either steam hot-water or vapor systems is written up in a way that is not only easy to understand but should give the home-owner a good idea of the principles underlying each of these systems.

A Better Deal for Oil Burner Dealers appears on the cover of a booklet designed to aid the oil-burner dealer, and issued by the dealer division of the American Oil Burner Association, 420 Madison Ave., New York. Thirteen plans are submitted, outlining advantages of organization and giving reasons why dealers should become members of local and national associations. Aids given the dealer by the American Oil Burner Association are enumerated, among them being various selling helps, aid in eliminating destructive competition, standardized cost-accounting methods, help on contractual relations between dealers and manufacturers, consulting and employment service, and aid in forming local associations. Size 6 in. x 9 in.

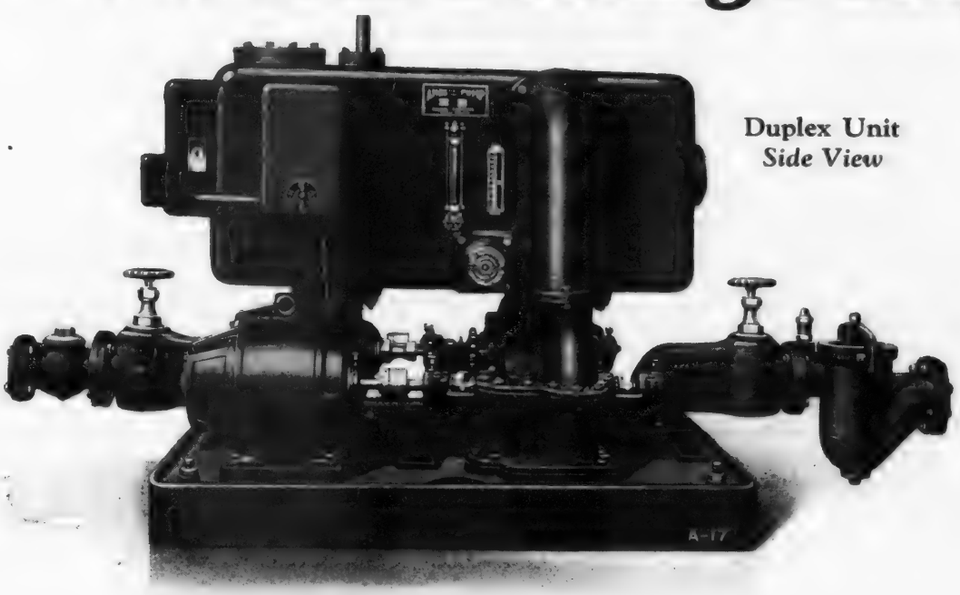
Does It Pay to Install an Oil Heater? is asked in the title and answered in the text of a circular received from the Oil Heating Institute, 420 Madison Ave., New York. A comparison of the cost of oil heating and coal heating, based on studies of the United States Bureau of Standards, is presented in tabular form, this being followed by a discussion of the advantages of heating by oil.

The Weather Vein, the interesting little magazine, published periodically by the Carrier Engineering Corp., 850 Frelinghuysen Ave., Newark, N. J., contains a history and description of the processes employed by the Meyercord Co., Chicago, largest producers of decalcomania. On the cover is a beautiful and brilliantly colored likeness of a parrot, the production of which was accomplished by the use of decalcomania. In the manufacture of this product, the Meyercord Company must have the air conditions exactly regulated, and the story explains how this was accomplished by Carrier air conditioning equipment.

The Last Word is the caption of a colorful folder sent by Williams Oil-O-Matic Heating Corp., Bloomington, Ill. A snow-covered home is illustrated, with a picture of an Oil-O-Matic, and a view of the interior of the home, cozy and warm.

Be Sure to See

The AMES Vacuum Heating Pump



Duplex Unit
Side View

Ames Vacuum Heating Pumps have created a sensation among heating engineers. The instant demand for these pumps proves the correctness of the new principles involved.

Space does not permit of detailed description, but we invite you to minutely examine the Ames Pump

At the Power Show

Booths 629-630

Competent engineers will be at your service for consultation and explanation, and you will be shown the inner construction and method of operation of these *"Distinctively Different"* vacuum heating pumps.

Write for Bulletin 52-C11

SEE OUR EXHIBIT
SEVENTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING
GRAND CENTRAL PALACE
NEW YORK
DEC. 3 TO 8 1928
AMERICA'S GREATEST POWER SHOW

AMES PUMP COMPANY, Inc.
90 West Street New York, N. Y.

DISTINCTIVELY DIFFERENT

Blake Testite Line Catalog for 1928 appears on the cover of a set of loose-leaf pages issued by the Blake Specialty Co., 1600 Mill St., Rock Island, Ill. This catalog describes the full line of piping and plumbing tools and equipment. Pictures and prices are given for each item in the line as well as specifications and dimensions.

The Business of Selling Oil Heat, a brief manual of retail oil-burner sales for dealers, has been issued by Preferred Oil Burners, Inc., Peoria, Ill. The booklet opens with a short chapter telling of advantages for the dealer in selling oil burners. The elements of good salesmanship then are discussed in a very readable manner, and this material tells the dealer how to convince prospects on the good points of Hart burners. In order to meet statements by competitive salesmen questioning the character and stability of the manufacturer, the dealers are supplied with information concerning the ability and money back of the Hart organization. Closing the sale is the subject of an interesting chapter, followed by valuable and definite information on how many interviews are needed to close a sale. The dealer is told how to locate prospects, how to advertise, and finally is told to "know your stuff." Full of important information, this booklet should prove of value to oil-burner dealers.

Known by the Name Diafram appears across the top of two pages of a small circular published by the Stack Heater Co., 150 Stuart St., Boston, Mass., manufacturers of the Diafram relief valve, indirect water heaters, gas water heaters and pressure reducing valves. The new folder is devoted to a picture and description of the company's relief valve designed for use on water and steam systems. This valve is sealed to prevent unauthorized adjustment.

Tank Contents Gauges, a folder by the Liquidometer Co., Inc., 173 Thomson Ave., Long Island City, N. Y., is devoted to a discourse on the construction, installation and operation of the Liquidometer Junior distance reading tank contents gauge. The installation of the gauge is fully explained by illustrations. Liquidometer Senior gauges also are shown.

Modern Homes Need Cordial Comfort, says the International Heater Co., Utica, N. Y., on the cover of a new 16-page pamphlet devoted to International boilers and heating equipment. Besides pictures, some in color, showing the details of construction and flue-gas travel through the round and horizontal boilers, there are descriptive cuts of grates for various sizes of coal. Tables in the last section of the pamphlet give guaranteed rating for square sectional boilers using 13,000 B.T.U. coal and 11,500 B.T.U. coal; commercial ratings; size of grates in inches; area of grates in square feet; additional area of side grates; coal capacity in pounds; minimum height of chimney, and the dimensions of the flue. This material is given for 56 different sizes of Economy boilers. Statistics on Economy round boilers are equally complete, figures being given for 36 different types. Besides the information mentioned above, figures are given on both the round and square boilers showing the outside dimensions, fire-box dimensions, size of fire-box door, size and location of tappings, dimensions of ashpits, and the asbestos covering required for each boiler. International domestic water heaters also are mentioned in this pamphlet.

Ross Products are described in a catalog received from Ross Heater & Mfg. Co. Inc., Buffalo, N. Y. Besides giving a great deal of valuable information and engineering data on the Ross crosshead-guided expansion joint and the Ross internally-guided expansion joint, this catalog includes information on the instantaneous heaters, feed water heaters, storage-type heaters and jet air pumps made by this company. Size 8½ in. x 11 in. Pp. 58.

New Ideal Gas Boilers are announced to be "ahead of the field as usual" on the cover of a new folder, published by the American Gas Products Corp., 376 Lafayette St., New York. The boilers are manufactured by the gas utilization department of the American Radiator Company. The folder shows pictures and gives specifications for 30 sizes of these gas boilers.

Mills Boilers, manufactured by the H. B. Smith Co., Westfield, Mass., are described and pictured in a 32-page booklet recently issued to the trade. Cutaway views show the features of the various types and sizes of Mills boilers, flue-gas travel, and details of grate and fire-box construction. Tables give the dimensions of the boilers, valve sizes, recommended chimney sizes, size of tappings, dimensions of supply drums and return drums, and the commercial ratings of boilers from 6 to 14 sections. The last part of the booklet is devoted to a discussion of oil as fuel for these boilers. Pictures show the manner of installing oil burners of different types. On the last page mention of the new H. B. Smith full-surface radiator is made. Size 4 in. x 7 in. Pp. 31.

The Mercoid Risertherm, a surface-type control for hot water, is treated in Bulletin S-64 of the Mercoid Corp., 564 West Adams St., Chicago. The bulletin is a 4-page folder, printed in color, containing pictures of the Risertherm as it is installed on hot water pipes, and presenting drawings showing the construction of it. Other drawings show wiring diagrams for installing the equipment in connection with various types of heating equipment. The Risertherm is a control that is installed on the surface of a hot-water pipe and is actuated by the heat that the pipe gathers from the water flowing through it.

Sturtevant Tempervane Heating Units are the subject of Catalog No. 363 of the B. F. Sturtevant Co., Hyde Park, Mass. Its 44-pages contain complete information on the construction, installation, and operation of these heating units. It is illustrated with photographs of the units, both the floor type and the suspended type; installations, and tests. Numerous curves and tables tell graphically what to expect from the performance of the fans and blowers, and from the performance of the whole unit heater. The last few pages of the booklet contain tables showing the heat losses by conduction and radiation through different types of building material, and the various parts of a building; specifications for several sizes and capacities of heaters, and also drawings showing the construction of the heater parts.

These heaters operate by blowing air from a fan over Aerofin tubing, the air then being distributed throughout the space to be warmed. Size 8½ in. x 11 in. Pp. 44.

Oil Heat, The Joy of More Than a Million Homes, is the caption appearing on a beautifully illustrated consumer's booklet, issued by the American Nokol Corp., 4200 Schubert Ave., Chicago. The text, which is large and easily read, describes the many advantages of oil heat, and in particular tells the advantages of the Nokol burner. Sectional views of boilers and burners in the back show the application of the five models of the burner manufactured by this company.

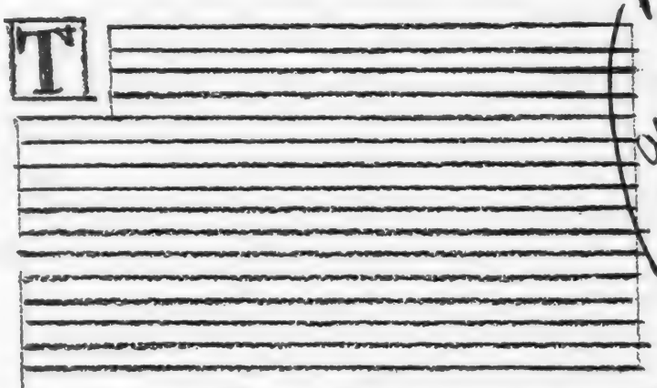
Webstergrams, a monthly publication of the Warren Webster Company, Camden, N. J., included in its August issue a great deal of interesting data on the Webster Moderator system. According to this publication, half of the State Office Building at Lansing, Mich., was heated by a Webster Moderator system while the other half was heated by a standard vacuum system. Brief tests indicated that the steam consumption in the half using the Webster Moderator system was 50% less than that in the other half. A photograph of the largest hotel in the British Empire, the Canadian Pacific Railway Company's "Royal York" Hotel in Toronto, Can., was shown. This building will have 80,000 sq. ft. of direct radiation, and the Webster Moderator system will be installed.

SOLD

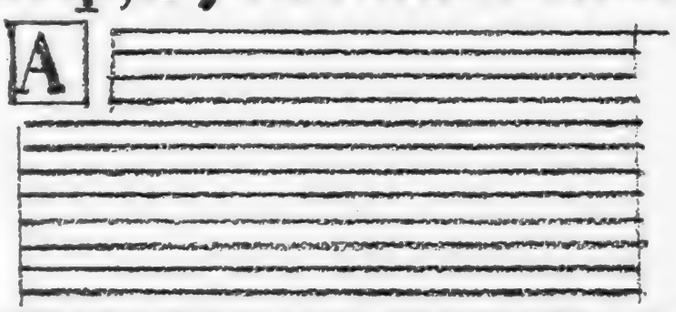
Up to Sept. 30, Hart installations have exceeded any previous full year.

F. D. C.
Never mind the text
Your headlines tell the story
Release as is
A. E. M.

And three good months to go—with plenty of furnace for immediate shipment



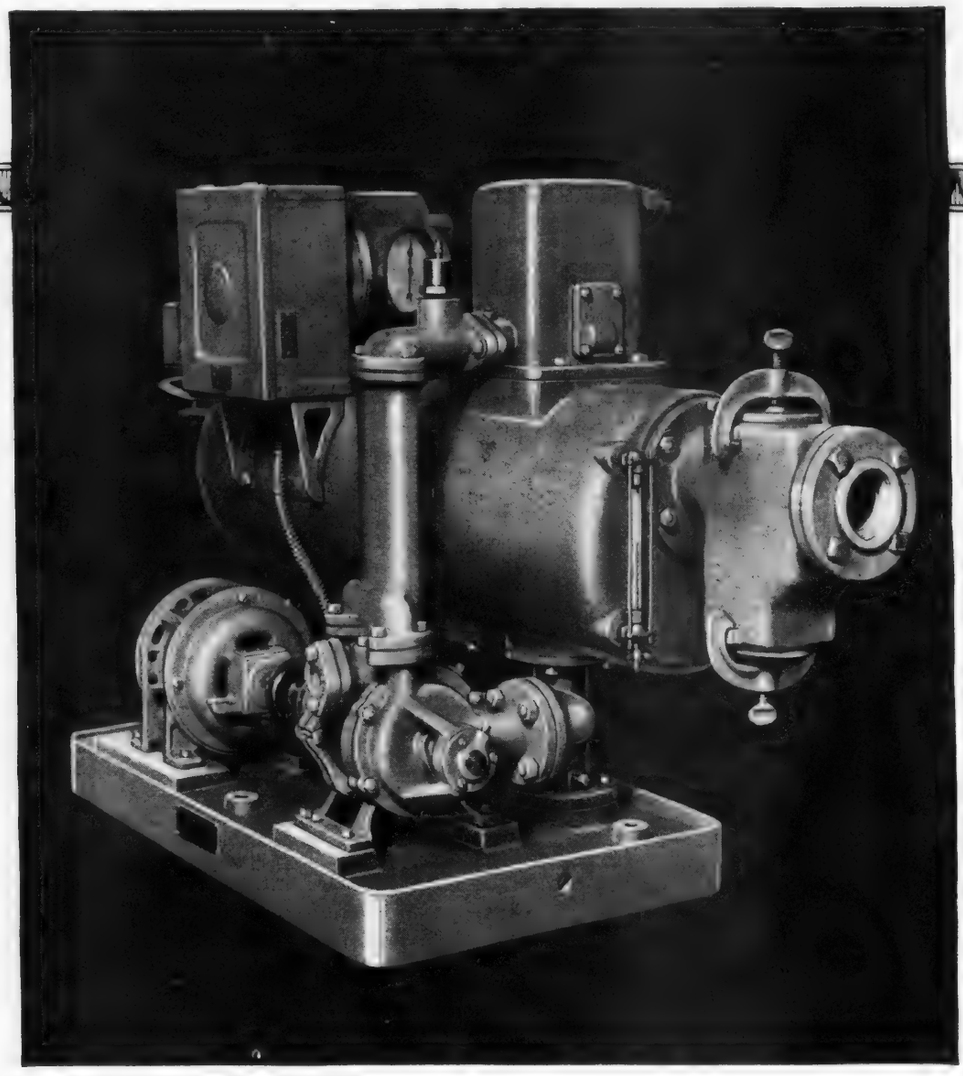
Compare the burner, the price, the Sales and Advertising help, if you want to learn why



ASK TO BE PUT ON OUR FUTURE DEALER LIST IF YOU WANT ALL THE DOPE MAILED TO YOU

PREFERRED OIL BURNERS, INC.
PEORIA, ILL

HART OIL HEAT



The *single* motor . . . serves a *double* purpose

COMPACT simplicity — ease of maintenance — any engineer who has run a Jennings Vacuum Heating Pump will tell you that these are outstanding advantages.

An air pump and a water pump—combined in one casing—mounted on the same shaft—are driven by a single automatically controlled motor. There is only one self-starter, and this is actuated both by the return float switch and the vacuum regulator.

Compare this arrangement with an outfit consisting of separately driven air and water pumps. Here there are eight bearings to take care of instead of only four for a Jennings. Two motor starters instead of one.

Write for Bulletin 71, giving full details of design and operation.

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK CONN.

Trade and Miscellaneous Notes

Coming Events

December 3-7, 1928. Annual meeting of American Society of Mechanical Engineers, in New York. Headquarters at the Societies' Building, 29 West 39th Street.

December 3-8, 1928. Seventh National Exposition of Power and Mechanical Engineering in New York. Headquarters at the Grand Central Palace.

December 4-5, 1928. Mid-year meeting of the National Warm-Air Heating Association in Buffalo, N. Y. Headquarters at the Statler Hotel.

January 28-31, 1929. Annual meeting of the American Society of Heating and Ventilating Engineers in Chicago, Ill. Headquarters at Edgewater Beach Hotel.

April 9-11, 1929. Sixth annual convention of the American Oil Burner Association in New York. Headquarters at the Hotel Pennsylvania.

April 24-26, 1929. Annual meeting of the National Warm-Air Heating Association in Chicago. Headquarters at the Hotel Stevens.

Miscellaneous Notes

September building operations, as reported by the F. W. Dodge Corporation, show the highest September contract total on record, representing a 13% increase over the total for September, 1927, and a 14% increase over August of this year. The figures for the 37 states east of the Rocky Mountains were $587,674,000. Analysis of this record shows that 35% of all construction was for residential buildings, 20% for public works and utilities, 19% for industrial buildings, 10% for commercial buildings, 7% for educational projects, and 4% for hospitals and institutions.

Contracts in New York State and Northern New Jersey amounted to $154,895,500, representing an increase of 22% over August of this year and a gain of 46% over the same month last year. The New England States report a contract total of $71,611,100, which shows an 84% increase over August and 108% over the total for Sept., 1927.

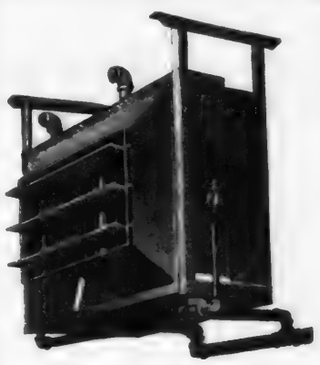
In the Middle Atlantic States figures amounted to $66,170,000, which represent a 30% increase over the previous months and a decrease of 15% from the total for September of last year. Contracts in the Pittsburgh district amounted to $75,499,800, representing an increase of 32% over August and an increase of 7% over September of last year.

Contracts in the Central West amounted to $154,744,200, showing a 12% decrease from the August total and a 6% decrease over September, 1927. In the Northwest figures reported a total of $6,811,400, representing a decrease of 35% from August and a 24% increase over the same month last year.

The Southeastern States report figures amounting to $51,780,900, showing an increase of 6% over August of this year, but a decrease of 9% from the total for September of last year. Texas reports contracts amounting to $15,161,100, representing a 12% decrease from the previous month and 4% from September, 1927.

SAVE!

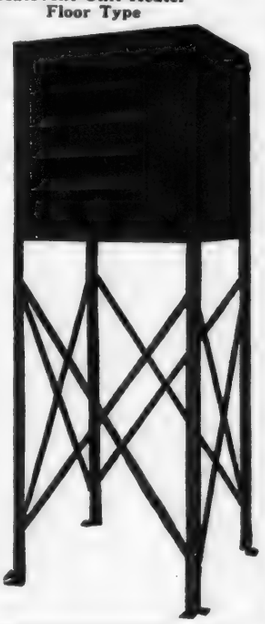
Economy with safety and service is one of the outstanding features of AUTOVENT Unit Heaters. Saves labor by quicker installation and fewer units are needed for equivalent heat radiation. Less piping and fewer fittings. Gives more rapid heat-spread. Has greater flexibility of control. Units can be shut down when not needed. Get full information, today about



Autovent Unit Heater Ceiling Type

Special Features — Heavy duty motor. Specially designed Fan Wheel. Extra large pressure chamber. Tapered discharge. Performance positively guaranteed. Built for continuous duty.

Autovent Unit Heater Floor Type



AUTOVENT

REGISTERED AUTOVENT.

Unit Heaters. The great saving in time, labor and money will certainly interest you. And all this saving can be accomplished and at the same time better heating efficiency secured.

SEE OUR CATALOGUE IN SWEETS

AUTOVENT FAN & BLOWER CO.

1805-27 N. Kostner Ave., CHICAGO, ILL.

J. H. Witte, of the Underwriters' Laboratories, Chicago, has been appointed to succeed B. K. Breed as division engineer in charge of the oil-burner division of the gases and oils department. Mr. Witte has been intimately associated with Mr. Breed for over three years in the testing of oil burners, in the development of the present standards for the construction of oil burners, and in the extension of the factory inspection service and labeling of domestic oil burners. Mr. Breed has joined the Preferred Utilities Company, in New York, as announced in THE HEATING AND VENTILATING MAGAZINE for October.

New Radiator Company in Canada

A new company has applied for a charter under the name of the Imperial Iron Corporation, Ltd., to take over the assets of the Imperial Radiator Co., Ltd., St. Catherines, Ont. Those connected with the formation of the new company include men well known in the financial and industrial life of Canada and many of them have been associated with the heating and plumbing trades for many years.

It is reported that the following are among those to be associated with the new company: A. L. Ellsworth, president, British American Oil Co., Ltd., Toronto; Harry Knight, manager, Service Stations Equipment Co., Ltd., Toronto; Alexander Dawson, manager, Toronto Iron Works, Ltd., Toronto; Frank Sutcliffe, president, John Wood Mfg. Co., Conshohocken, Pa.; Victor Mauck, John Wood Mfg. Co., Conshohocken; Fred Kelly, manager, and Leonard Sutcliffe, superintendent, Canadian John Wood Mfg. Co., Ltd., Toronto; W. W. Snider, St. Jacobs, Ont.; C. W. Snider, Waterloo, Ont., and L. L. Anthes, president, Anthes Foundry, Ltd., Toronto.

Canadian Radiator and Boiler Company to Enlarge Plant

Improvements, which approximately will cost $200,000 are to be made to the Brantford plant of the Dominion Radiator & Boiler Co., Brantford, Ontario. The directors recently voted a total appropriation of $500,000 to be spent on their two manufacturing plants at Brantford and Toronto.

Changes at the Brantford plant will be directed mainly toward standardization of manufacturing, with some possible rearrangement of departments to make the most use of plant space and improvement of equipment. The program for improvement is under the direction of D. J. Macdonald, manager of manufacturing.

The other $300,000 of the half-million appropriation is to be spent on the Toronto plant and work is to be started on both of the plants at once, as all of the changes are to be completed by the first of January. Production will not be interfered with while the work is in progress.

Manufacturers' Notes

The Bishop & Babcock Mfg. Co., Cleveland, O., of which the Bishop & Babcock Sales Company, is the marketing agency, announces the removal of its Massachusetts Blower Division factory from Watertown, Mass., to Cleveland, where a new building has been constructed with new machinery and every facility for the manufacture of fans, blowers, air washers, unit heaters and other miscellaneous heating and ventilating equipment. The Bishop & Babcock Company of Massachusetts has been dissolved and the administration, engineering, purchases and products for the Massachusetts Blower Division, are handled by the parent organization in Cleveland.

The following are changes in personnel: J. C. Thompson, formerly in charge of the Chicago office and then manager of the company in Watertown, has been appointed sales manager of the heating and ventilating division, which handles the sale of Massachusetts Blower Division products, Bishop & Babcock steam specialties, and Bishop & Babcock system of automatic temperature regulation. R. H. Gallagher, for sixteen years draftsman and then superintendent of production at Watertown, has been appointed sales representative of the blower division in New England, with headquarters at 1107 Metropolitan Bldg., Boston, Mass. J. E. Sorenson, formerly with the Autovent Fan & Blower Company, has joined the Chicago office to handle the sale of unit heaters and fan equipment in the industrial field. Mathis J. Dring, formerly with the sales order department, will be the representative for the Northern Ohio territory.

McDonnell & Miller, Chicago, manufacturers of McDonnell & Miller duplex boiler feeders, are extending their activities in the eastern territory. L. B. Miller, in charge of production and engineering, is maintaining headquarters at the company's New York office, Grand Central Terminal Building, which is under the management of W. E. De Young. Mr. Miller will remain in the east until the middle of December.

Wagner Electric Corp., St. Louis, Mo., announces the addition of R. W. Piper to the transformer sales division to travel the Wagner southeast district including a section of West Virginia and the states of Virginia, North Carolina, South Carolina, Alabama and Florida. H. D. Epting has been transferred from the Philadelphia sales office to the Atlanta sales office.

Linde Air Products Co., New York, has established a new plant at 125 Settlement St., Akron, O., for the production of oxygen, and this plant will supply the nearby demand for oxygen used in welding and cutting by the oxy-acetylene process. A. Deagon is superintendent.

Gulf Oil Burner Co., New York, announces the removal of its offices to Room 1738, 101 Park Ave., where it will operate under the new corporation, The Holby Burner Corporation.

Hurlbut and Van Vleck, and Edwin A. Kingsley announce the formation of an association to continue the practice of consulting structural and mechanical engineering, with joint offices at 101 Park Ave., New York.

D. & T. Mfg. Co., St. Louis, Mo., has appointed R. A. Campbell as vice-president and general sales manager with headquarters at the general sales office at 15-16 South Clinton St., Chicago. Mr. Campbell formerly was associated with James P. Marsh & Company.

Caloroil Burner Corp., 225 West 34th St., New York, has opened a sales laboratory at 17 South Third Ave., Mount Vernon, N. Y., which will operate under close supervision of the main office. Dealers' salesmen needing training will be welcomed at the laboratory and given a thorough education in the field rather than in a classroom. Charles R. Bishop, who has been with the Caloroil company since its inception, is in charge of the Mount Vernon office.

The following additions in personnel are announced: Frank Glenn, formerly an executive in the sales department of the Atlas Portland Cement Company, has joined the New York office of the company as sales promotion manager. John Richter, who has been associated with the Cities Service Co., Boston, in the fuel department, is with the Boston office of the Caloroil organization.

New dealers appointed are: Lovel S. Burtis, Cedarhurst, L. I.; Jowein Products Corp., Jamaica, L. I., N. Y.; Waterbury United Burner Co., Waterbury, Conn.; Austin Electric Supply Co., White Plains, N. Y.; John Rendall, Cliffside, N. J.; Frank Ackerman, Hackensack, N. J.; Lee Fish, Cheboygan, Mich.; Wallace Strong, Dalton, Mich.; Quish, Steptoe & Arksey, Dexter, Mich.; Woodworth Bros., Fenton, Mich.; Montcalm Service Station, Munising, Mich., and M. Miller Plumbing & Heating Co., Port Huron, Mich.

The Old Timer Knows

Jack: "Don't these unit heaters ever leak?"

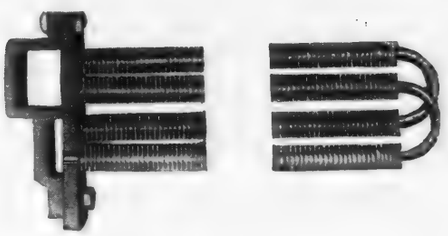
Old-Timer: "Never heard of a Thermolier leakin'. Why that's the same gasket arrangement used in high pressure steam work."

THE copper tubes forming the heating surface are expanded into the header-plate forming rolled joints such as have been used for decades in many types of power and heating equipment.

All chance of leakage is eliminated in the Thermolier by very simple and well tried construction. Only one gasket is employed and that is of the same type used in high pressure steam work, heavily bolted against wide surfaces between the header-plate and the header itself.

Finally, the chance of leakage resulting from expansion strains is eliminated by using perfect U-shaped expansion bends in every tube of the Thermolier.

These everlasting features are, however, only two of the 14 points of superiority which put the Thermolier in a class by itself. Why not acquaint yourself with the other 12 points of merit which characterize this modern unit? A booklet describing them is yours for the asking. Use coupon or your own letterhead.



Horizontal section through Thermolier header, showing wide, heavily-bolted gasket and two of the 50 U-tube expansion bends which form the copper core of the unit. Each end of each tube is expanded into the cast-iron header-plate.

GRINNELL COMPANY

Executive Offices: Providence, R. I.

Branches in all Principal Cities

14 Points of Superiority

GRINNELL COMPANY, INC.
208 W. Exchange St., Providence, R. I.

I want to read more facts about the Thermolier. Send along the booklet.

Name_____

Address_____

City_____

Cutler-Hammer Mfg. Co., Milwaukee, Wis., has appointed N. L. Mortenson, for 21 years with the company, to be chief engineer. T. E. Barnum, formerly chief engineer, has been made consulting engineer for the company and will devote his time to engineering problems and outside engineering relations.

S. T. Johnson Co., Oakland, Calif., announces that V. C. Kylberg has joined the company as a special representative, working at present in the East in charge of dealer and distributor activities. Mr. Kylberg formerly was in charge of national sales for the Iroquois Electric Refrigeration Co., New York.

Another appointment is that of the Islands Welding & Supply Co., Ltd., of Honolulu, who will be distributors of Johnson oil burners and oil-burning equipment throughout the Hawaiian Islands. P. Nielsen, McComb, Miss., has been appointed representative throughout the southwestern portion of Mississippi. D. P. Mulligan, Roseville, Calif., and F. R. McGrew, Woodland, Calif., have been appointed by the Sacramento factory branch as representatives in their respective territories.

Baker Steam Motor Car & Mfg. Co., Pueblo, Colo., announces that interests in the Baker oil burner, formerly held by Messrs. Vail, Glascoe and Devine, have been bought by a syndicate in Denver, and that the general offices and equipment of the company have been moved from the plant in Pueblo, to the factory of the General Iron Works, Denver. M. H. Block has assumed the management of the new company.

Peabody Engineering Corp., 110 East 42nd St., New York, has appointed Walter Castanedo, Inc., 1115 Maritime Bldg., New Orleans, La., as agent in the states of Louisiana and Mississippi.

Kleen-Heet Atlantic Distributing Co., Inc., New York, distributors of Kleen-Heet products of the Winslow Boiler & Engineering Co., Chicago, has moved its offices from 46 East 41st Street to 11 West 42nd Street. Announcement is made that Dubin & Co., 32 Allyn St., Hartford, Conn., is the new Hartford dealer for Kleen-Heet products.

Bloom & Kamrath, 330 South Dearborn St., Chicago, has been formed as a new organization to conduct a consulting and architectural engineering business. S. C. Bloom, for many years has been a recognized authority on refrigeration and air conditioning and is well known for his work in the development of his brine spray refrigerating system. In 1925, he organized S. C. Bloom & Company for the manufacture of refrigerating equipment and specialties and also to do a general consulting and engineering business. Charles F. Kamrath has been actively identified with the meat-packing industry. From 1898 to 1907, he was with Swift & Company and later he designed and supervised the erection of meat-packing plants in which field he became a nationally-known specialist.

C. A. Dunham Co., Chicago, announces the incorporation of C. A. Dunham Co., Ltd., of the United Kingdom, with offices and warehouse at 18 St. Thomas St., London. All business of the company in Great Britain and parts of Europe will be handled by this office. A. J. Assheton, who has been in charge of the London sales office operating under C. A. Dunham Co., Ltd., of Canada, has been appointed managing director of the new company.

Coen Oil Burner Co., San Francisco, Calif., and the United Death Valley Clay Companies, Inc., have been merged. The Coen company manufactures an industrial oil burner.

Mason Engineering Co., Springfield, Mass., distributors for the Petro residence and industrial oil burner, has opened a retail salesroom at 380 Worthington Street. The local office is under the supervision of Trafton Mason, who, for the past three years, has been an active member and half owner of the Emerson and Mason companies in Boston, with branches in the vicinity.

Chicago Pump Co., 2336 Wolfram St., Chicago, has appointed H. J. Kelly, Louisiana Bldg., New Orleans, to travel in the New Orleans territory which previously was in charge of F. H. Chisholm.

Reif-Rexoil, Inc., 52 E. North St., Buffalo, N. Y., announces the appointment of Charles Heider, formerly with the Harvey-Haines Machine Company, as general superintendent. Another announcement is that the Advance Home Heating Co., Philadelphia, Pa., has taken a franchise for the sale and distribution of Rexoil burners in eastern Pennsylvania. Its department of oil heating, in charge of W. G. Leary, is equipped to meet the increasing demand for oil heating aparatus through a staff of Rexoil factory-trained men. Allan F. Reif, president of the company, has returned from an extended business trip during which he visited many Rexoil dealers. This trip is taken annually to keep before dealers the Rexoil code of sales ethics.

Dealers appointed are the Penn Heating Service, Harrisburg, Pa., with R. C. Barley, its president and director of sales.

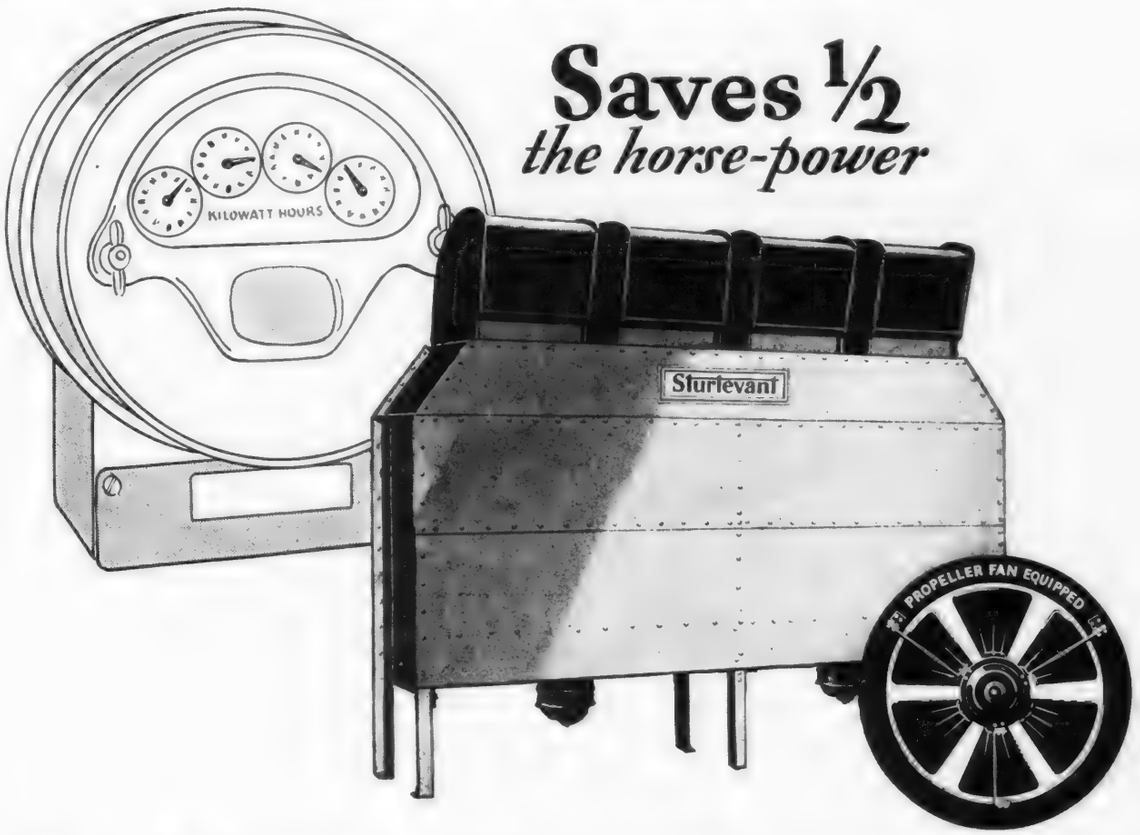
Gorton Heating Corp., 96 Liberty St., New York, announces the appointment of C. Ellis Hayes as a sales representative in the Philadelphia territory for the Gorton single-pipe vapor heating system and quarter-turn, packing, lock-radiator valves. Mr. Hayes will have headquarters at 300 Commercial Trust Bldg., Philadelphia.

Vesta Mfg. Co., 92-94 Sunswick St. Long Island City, N. Y., has been incorporated as a closed corporation under the laws of the State of New York, for $100,000, with no par value to its stock. The following are officers of the new company: Chairman of the board of directors, Joseph S. String; president, F. A. Jones; vice-president, John H. String; secretary and treasurer, F E. Gay. Messrs. J. S. and J. H. String have been in the oil-burner business for the past nine years, first handling only industrial and commercial installations. Three years later they organized a company to manufacture the "Vesta" oil burner, and number, among many large installations, the Mount Sinai Hospital in New York and practically all of the Poli chain of theatres in New England. The new corporation will make a specialty of commercial and industrial installations of both high and low pressure.

May Oil Burner Corp., Baltimore, Md., announces that William A. Webster, director of field engineering for the company, recently sailed for Europe to visit a number of Quiet May dealers and distributors in England and on the Continent, and to hold engineering schools in the major points. Export business of the company has increased to such an extent that a Paris office has been established at 15 Rue de la Paix, to handle European business. This office will be in charge of Edward Grossman.

The Carborundum Co., Perth Amboy, N. J., has moved its assembling plant from Rhode Island to Perth Amboy.

Silent Automatic Corp., Detroit, Mich., announces that its Detroit branch, the Silent Automatic Sales Corporation, has moved from 1517 Broadway to Grand Circus Park at Madison St. September 24-29 was set aside for housewarming week. The new showroom occupies 12,000 sq. ft. on four floors in an entire building and also houses the forty men of the sales force. The company reports the addition to its staff of Ray Morton Hardy, who has had a wide experience as sales counsellor and instructor in practical selling. Another addition to the personnel is R. M. Douglass, who will serve in the capacity of advertising manager. He formerly was advertising manager of the Kelvinator Corporation. L. V. Quinn and T. Russell, who have been associated with Silent Automatic almost since its inception, have been appointed to supervise and direct the installation and service department of the Philadelphia branch.



Saves ½ *the horse-power*

"The Meter will prove our point!"

The "Tempervane" requires 50% less current than units equipped with centrifugal type fans!

LET a Sturtevant Engineer explain how the "Tempervane" effects this economy in industrial heating:—

"The 'Tempervane' Unit Heater utilizes Aerofin heating elements. These elements offer a very low resistance to air. Propeller fans operate at their highest efficiency against low resistances, whereas centrifugal fans operate at lowest efficiency against low resistances.

"The issue was plain and clean cut. We chose propeller fans, cut motor horsepower fifty per cent and halved the current consumption. Exhaustive laboratory and service tests have proved we were right—and the meter will prove our point!"

Suspended type "Tempervane"

Precedent played no part in the design of the "Tempervane". It would have been just as easy to have specified centrifugal fans (of which, Sturtevant manufactures thousands), but our Engineers were out to design a better unit heater . . . better in performance . . . most economical in current consumption.

The "Tempervane" is the result. It has been subjected to the most exacting laboratory and service tests ever conducted . . . It has proved itself by meeting the highest standard ever established for industrial heating equipment.

We would welcome your request for indisputable evidence of "Tempervane" economy. Write our nearest office for Catalog 363.

B. F. STURTEVANT COMPANY

Plants and Offices at: Berkeley, Cal.—Camden, N. J.—Framingham, Mass.—Galt, Ontario—Hyde Park, Mass.—Sturtevant, Wis.

Branch Offices at: Atlanta; Birmingham; Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; Cleveland; Dallas; Denver; Detroit; Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; New York; Omaha; Pittsburgh; Portland; Rochester; St. Louis; San Francisco; Seattle; Washington, D. C.; *Canadian Offices at:* Toronto, Montreal and Galt.

Also Agents in Principal Foreign Countries.

Sturtevant REG. U.S. PAT. OFF. *Tempervane* **Heating Units**

Classified Advertising

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING SPECIALTY SALESMAN WANTED—Well-known company requires high grade sa esman in New York for thermostatic radiator traps and inlet valves. State education, training, past experience and salary required. Address Box 111, care of Heating and Ventilating Magazine.

WANTED—Salesmen who are handling furnaces and can sell a side line to dealers. Open territory in every part of the country for sale of modern appliance endorsed by the industry to increase heating efficiency of furnaces. Only those with responsible connections will be considered. Give complete history of selling experience with references, territory covered, name of company now associated with, etc. App ications confidential. Address Box 112, care of Heating and Ventilating Magazine.

SALES ENGINEERS WANTED

One of the oldest, largest and most reputable concerns in the United States, manufacturing heating specialties for vacuum and vapor heating systems, has territory available for competent organization or engineering salesmen who are well established and financially responsible. The products of this company are nationally advertised, the line is complete and offers unlimited possibilities to capable representatives. Some territory will be new, some is territory now covered where a change will be made and includes some of the large metropolitan centers. Consideration will be given only to those fully meeting qualifications, and all replies will be treated strictly confidential. Address Box 113, care of Heating and Ventilating Magazine.

SALES EXECUTIVE

Whose sales have maintained an evenly increasing stride year in and year out for over twenty years, is looking for a connection with some aggressive manufacturer of heating equipment.

His lifelong contact with the trade as well as heating engineers and architects will show immediate results.

Address

Cowan, Dempsey & Dengler
25 West 45th Street
New York City

POSITION WANTED—Thoroughly experienced estimator and construction manager in heating, ventilating, power and industrial piping, desires to make change. Detailed information furnished upon request. Address Box 118, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters, desires recognized representative on commission basis. Address Box 114, care of Heating and Ventilating Magazine.

VAPOR SPECIALTY REPRESENTATIVES WANTED—Some territories open at present, particularly in the west and south. Good proposition for established men who have following with plumbing and heating contractors and architects. State territory and other lines handled. Layouts not necessary. We are an old established company. Our heating system is simple and popular. Communications held strictly confidential. Address Box 115, care of Heating and Ventilating Magazine.

FOR SALE—2 second-hand No. 10 Niagara Conoidal Fans. 1 No. 14 Niagara Conoidal Fan. Both type "N". Good condition. Address Box 116, care of Heating and Ventilating Magazine.

FOUND!
Hidden Profits Uncovered

By simple investigation of trade details which is often called technical training. Let us help you reach out for the larger paying jobs that command the admiration of others. We furnish you a progressive program of investigation throughout the fall and winter for next spring's usefulness and profit. Our coaching is as good as private—it is personal, clear and direct to you. Come, write today about our methods for expanding your future opportunities. Full information is free.

- ☐ Heating and Ventilating Engineering
- ☐ Special Steam and Water Heating
- ☐ Plumbing Design and Installation
- ☐ Warm-Air Heating
- ☐ Contracting and Estimating
- ☐ Mechanical Drafting

Saint Louis Technical Institute
4541 Clayton Avenue St. Louis, Mo.

TO SELL

Modern cast-iron boiler foundry 60' x 250' (condition 100%) with R. R. Siding near Philadelphia. Equipped with:

4-Ton Electric Traveling Crane
Moulding Machines
Core Ovens
Electric Sand Mixer
1 Ton Electric charge floor elevator
63" Cupola
Air Hoists and Chippers
Sand Blast and Rumbling barrel
1 Ton Electric Hoist
Sanitary Washroom, etc.

Will contract for quantity castings at cost plus and supply our own equipment complete. Moulders and other help at hand. Liberal terms. Address Box 117, care of Heating and Ventilating Magazine.

WALWORTH

Walworth Company, General Sales Offices: 51 East 42nd Street, New York
VALVES, FITTINGS AND TOOLS FOR STEAM, WATER, GAS, OIL AND AIR

Plants at
Boston, Mass.
Kewanee, Ill.
Greensburg, Pa.
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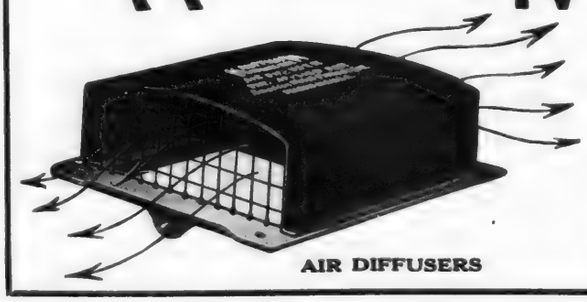
KAUFFMAN



AIR DIFFUSERS

SINCE 1908

Kauffman Air Diffusers

HAVE BEEN IN USE IN

Some of America's Finest Theatres

Simple to Install—Low in Price
Graduated Air Control

AMERICAN METAL PRODUCTS CORP.
ST. LOUIS, U. S. A.

Now industry is doing something about the weather

Mark Twain's comment that everybody talks about the weather but that nobody does anything, used to be true. Times have changed. Business has learned that indoors, at least, weather can be made to order.

Modern business men know that atmospheric conditions potently affect the output of their offices, factories and mills—in quantity and quality.

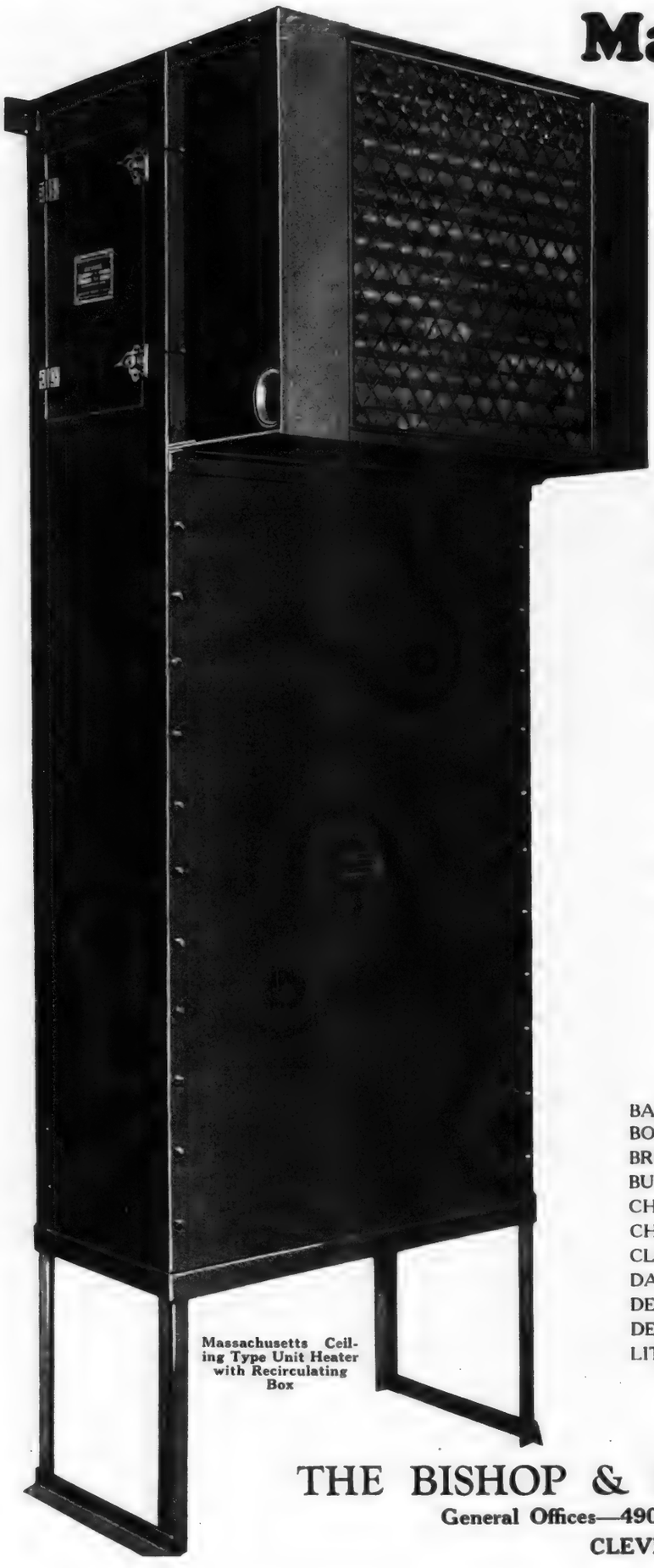
They know too that heating and ventilating engineers can control temperature, humidity, cleanliness and movements of the air—that workmen will do better work and more of it in the right atmosphere.

Are you prepared to meet the modern business man's demands? You can, if you will but keep up with the manufacturers of heating, ventilating, air conditioning and power equipment.

Their best will be exhibited at the Seventh National Exposition of Power, Mechanical Engineering, Heating and Ventilating. Place: Grand Central Palace, New York. Time: December 3 to 8, 1928. *Come, look and listen.*

The Power Capitol of the World
7th NATIONAL EXPOSITION POWER & MECHANICAL ENGINEERING HEATING & VENTILATING

Management International Exposition Company, Largest Industrial Exposition Organization in the World



Massachusetts Ceiling Type Unit Heater with Recirculating Box

Massachusetts Unit Heaters Meet All Requirements

Built in both ceiling and floor types, utilizing either steam or hot water.

Write for catalog No. 56 describing the details of all types and their application.

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UNIVENT and Glass—*make the difference*

HEATING and Ventilating Engineers and Contractors will find in the Univent the answer to the all-important problem of ventilation for schools, offices, banks, hospitals, and similar buildings.

Much simpler and much more efficient than opening windows—the Univent brings in fresh air from out-of-doors, filters it, warms it to a comfortable temperature, and gently distributes it to every part of the room—with invigorating air motion, but without draft.

Through Univent's *perfect* ventilation, health is protected. Human working efficiency is raised to new levels. Operating costs are appreciably lowered. These big benefits have established a new standard of ventilation in buildings everywhere.

Northern Life Tower, Seattle, Washington

A. H. Albertson, Architect
Jos. W. Wilson, Paul Richardson, Associates

Josiah C. Moore Company, Inc., Mechanical Engineers

McNeal Taylor Company, Inc., Heating Contractors

The thousands of successful installations in all parts of the country, and the sweeping endorsement of Univent by prominent architects, engineers, school and business executives—assure a continued demand for Univent Ventilation, and open up a remarkable sales and profit opportunity for Heating and Ventilating Engineers and Contractors.

Learn what the Univent brings in economy, flexibility, and ease of control. Ask us how we can help you sell Univent Ventilation. Just mail the coupon below for our engineer's Univent Catalogue.

UNIVENT
(TRADE MARK)
VENTILATION

Manufactured only by THE HERMAN NELSON CORPORATION, *Moline, Ill.*

Builders of Successful Heating and Ventilating Equipment for Over 20 Years

Sales and Service

BELFAST, ME.	SCRANTON	CLEVELAND	DES MOINES	ATLANTA	OMAHA	SEATTLE
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THE HERMAN NELSON CORPORATION
Moline, Illinois

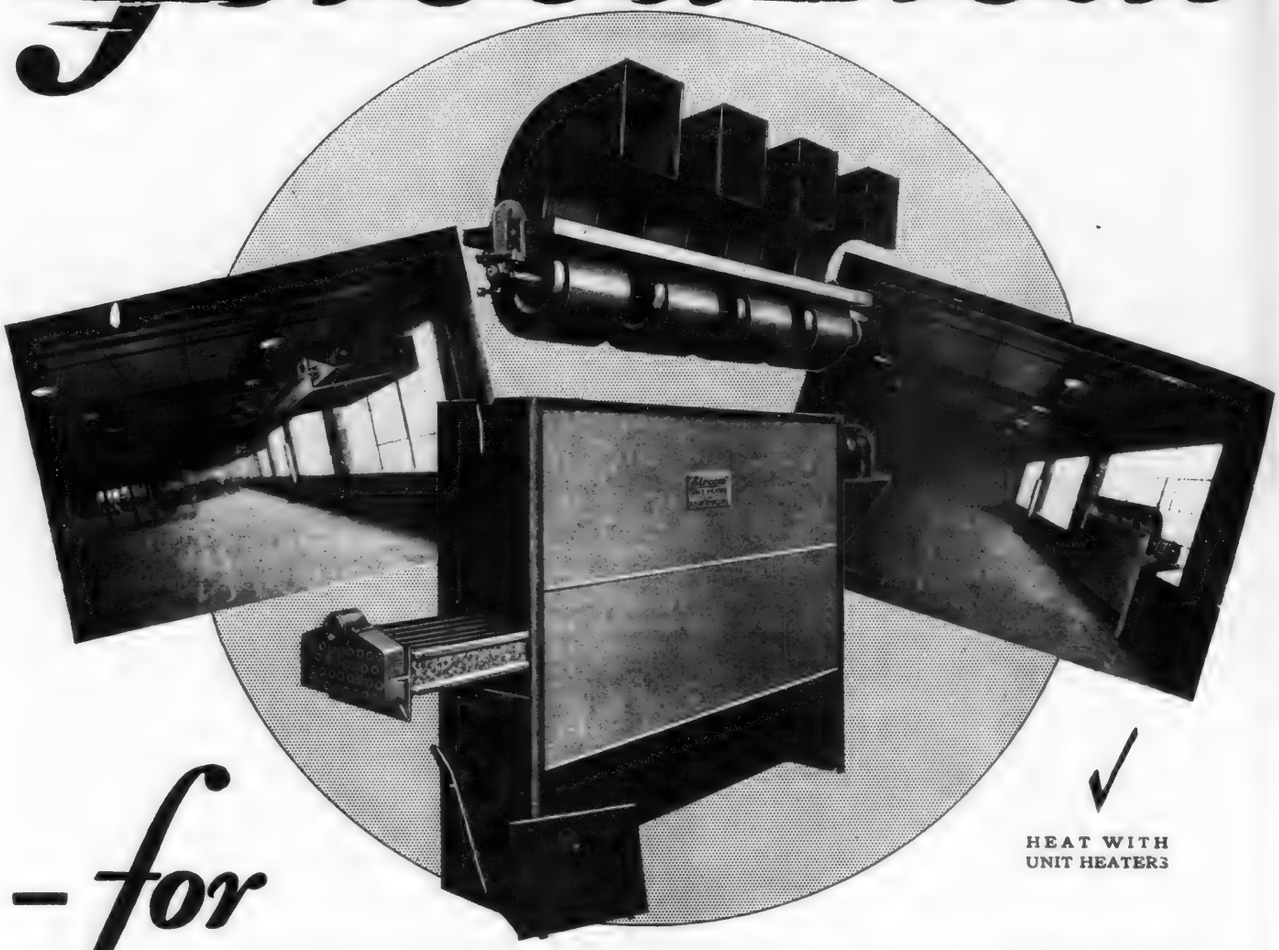
Please send, without cost or obligation, your book No. 24 explaining Univent Ventilation.

Name.....

Address.....

City.....State.....

Forced Heat



HEAT WITH
UNIT HEATERS

—for LARGE INDUSTRIAL AREAS

There are two significant reasons why you should have all the facts on the Sirocco Unit Heater . . . first, because it has features of design and construction that heretofore have not been obtainable in any heating equipment, regardless of price or type . . . second, because the Sirocco Unit Heater is a product of American Blower . . . built as only American Blower, with its vast resources, complete facilities and forty-seven years' experience, builds heating and ventilating equipment. The Sirocco Unit Heater is the companion to the world-famous Venturafin Unit Heater . . . it is the *built-to-order* heating unit for large industrial areas . . . that forces heated air where you want it . . . when you want it . . . and as much as you want . . . that actually puts "waste heat" to work — reduces "heat loss" to a minimum, and distributes heated air more evenly in working areas . . . and it ventilates as it heats — or can be used for either heating or ventilating alone. Sirocco Unit Heaters are made in 28 sizes and capacities for both floor and ceiling applications. Mail the coupon today for complete information — no obligation.

C O U P O N

Please send me complete information on the Sirocco Unit Heater for:

*Type of Building*_____

*Name*_____

*Firm*_____

*Full Address*_____

American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

AMERICAN BLOWER CORP., DETROIT, MICHIGAN
CANADIAN SIROCCO CO., LTD., WINDSOR, ONTARIO
BRANCH OFFICES IN ALL PRINCIPAL CITIES

Plant of Eternit, Inc., St. Louis, Mo., Main building, 904 feet long, 154 feet wide, 35 feet high

Eternit, Inc., bought Skinner Brothers Heaters *because:*

they knew Skinner Brothers' reputation for solving difficult heating problems

They knew that, not only did this company originate the Unit Method of heating but that, for over a third of a century, they have been applying it to buildings all over the country with marked success. Naturally this vast accumulation of heating experiences has equipped them to provide effective heating even under the most difficult conditions.

Thousands of installations, many of them in buildings formerly thought of as *impossible to heat*, form the foundation for the Skinner reputation.

To further that reputation, Skinner Brothers not only guarantee to provide adequate heat to overcome all heat-losses but to circulate that heat *equally* to every cubic foot of the *work-area*, without allowing valuable B. T. U.s to waste themselves in the unused spaces overhead.

You, too, will find it well worth while to give careful consideration to the reason for the selection of Skinner Heaters by a large corporation like *Eternit, Inc.* Feel free to call on a Skinner man without obligation.

Skinner Brothers Mfg. Co. Inc.

1470 S. Vandeventer St. Louis, Mo.

***work-area* Heating**

New York Office 1710 Flatiron Bldg.

Branches in 30 principal cities

H9

Originators of the Unit Method of *work-area* Heating

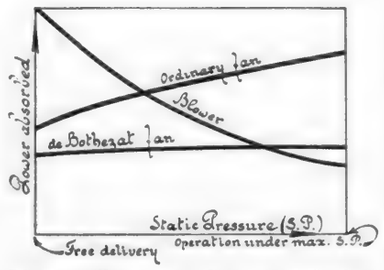


Diagram illustrating the non-overloading power characteristic of De Bothezat Disc Pressure Fans.

The diagram gives the power curves plotted against static pressure for three different types of fans.

FOR THE ORDINARY DISC FAN: The power increases as the pressure increases.

FOR THE BLOWER: The power decreases as the pressure increases.

FOR DE BOTHEZAT DISC PRESSURE FANS: The power is practically constant under any pressure from free delivery to no delivery. Thus:

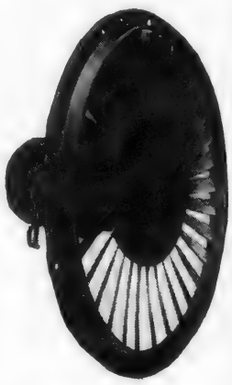
FOR THE ORDINARY FAN: The motor may be overloaded and may burn out if the static pressure increases (for example a wind blowing against the fan).

FOR THE BLOWER: The motor will overload and may burn out if the static pressure decreases (for example a leakage in the ducts).

FOR THE DE BOTHEZAT DISC PRESSURE FAN: The power remains practically invariable under any pressure. This fan will never overload the motor. It is the ideal fan to be used with complete safety under any conditions.

De Bothezat Disc Fans

High Efficiency at either High or Low Pressures



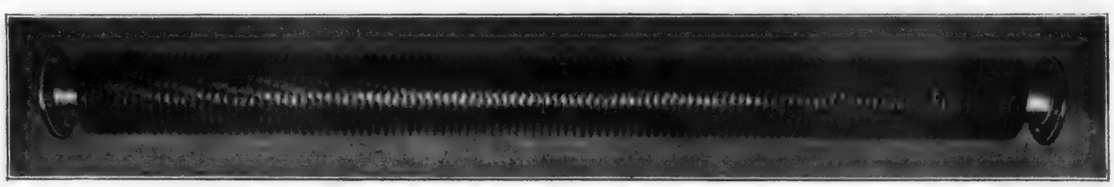
Manufacturers of both blowers and fans emphasize the fact that, at low pressures, disc fans require materially less power.

De Bothezat Disc Fans have non-overloading power characteristics and thus ***work with equally high efficiency at high and low pressures.***

For any ventilation problem, consider De Bothezat Pressure Fans

DE BOTHEZAT IMPELLER CO., Inc.

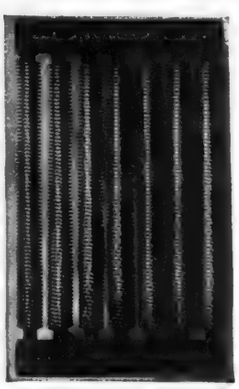
1922 Park Avenue, New York City



Specify K RADIAFIN TUBES for air-heating and air-cooling units

These tubes have 6 to 10 times as much surface as plain tubes of same size.

Units built with them have more surface and greater capacities with fewer tubes and fewer joints.



½" to 6".
Lengths up to 15 ft.
High or low pressure.
Plain or flanged ends.
With or without headers.
Quantity production.

Ask our Heat Transfer Dept. for additional details.

SCHUTTE & KŒRTING Co.

1153 Thompson Street PHILADELPHIA, PA.

"Heat with Unit Heaters"

COMET
UNIT-HEATERS

Will Operate Efficiently at ANY Steam Pressure!

COMET Unit Heaters contain no cast, soldered or brazed materials. With their sturdy welded construction they are not affected by air-bound pounding, waterlogging or freezing. Every one is tested under hydrostatic pressure and guaranteed to withstand unlimited steam pressure.

Comet Unit Heaters will also resist rust, corrosion and oxidation for the *lifetime of the entire heating system.*

The scientific design and construction of the tubes give unusually large heating surface.

Comet Unit Heaters are furnished in both overhead and floor mounted types in several sizes to meet every building requirement.

Send for Bulletin 105 *showing guaranteed performance at various pressures*

Fans · · Blowers
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NEW YORK BLOWER COMPANY

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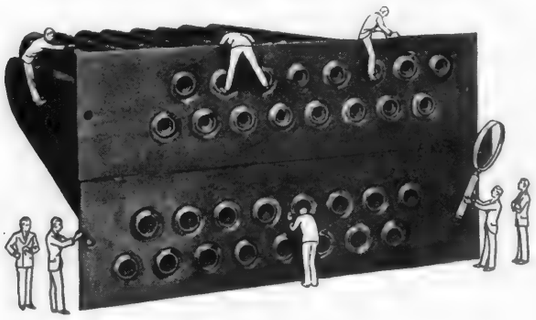

FIND the weakest point in this coil

It's not at the joints—there aren't any. Each tube is fused to the header.

It's not in the fins—they're actually imbedded in the tube, giving three-side contact.

There isn't any strain from expansion and contraction . . . that's eliminated by the U-tube construction.

As to the casing: far from any weaknesses, it has conveniences of arrangement which mean dollars saved in stacking, handling and removal of coal for cleaning.

Strength? Each coil is tested to 1000 pounds hydrostatic pressure and guaranteed for 200 pounds operating pressure.

Each copper tube, with its smooth, imbedded copper fins, *has the strength of a wire-wound gun barrel.*

It is the first and only extended surface coil for blast radiation combining these structural advantages. Severe service tests have failed to find any "weakest point" in its armor.

YORK SUPER-FIN RADIATION

YORK SUPER-FIN

YORK HEATING & VENTILATING CORP'N

1539 Sansom Street, Philadelphia

ENGINEERED PRODUCTS

Type "V"

Makes TWINFAN

heating efficiency available for

STORES
GARAGES
WORKROOMS

and other small spaces

The new Type "V" Twinfan Unit Heater makes it possible to secure the same efficiencies for small heating requirements that were formerly available only for large installations.

The new Type "V" embodies all of the features which have made Twinfan the preferred Unit Heaters including

Light weight Copper Radiator with screwed ground joints, and all other Twinfan Improvements and Refinements.

Bulletin Number 215 contains complete information regarding capacities and other details. Write for it today.

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4534 W. NORTH AVE. CHICAGO, ILL.
HEAT WITH TWINFAN UNIT HEATERS

Architects sketch of Title Insurance Bldg., Los Angeles, Calif.
Architects: John & Donald Parkinson

Ellicott Lee Ellingwood, Consulting Engineer.

Scofield Engineering Company, General Contractors.

Pacific Pipe & Supply Co. Berg Heating & Ventilating Company, Sub-Contract on Ventilating Work.

Assuring dependable service for years to come

Competent engineers and architects, in planning a heating and ventilating system, choose equipment that has proven its absolute dependability. They base their selections on the strength and rigidity of the apparatus, flexibility of the units, silence of the system and the cost of the installation.

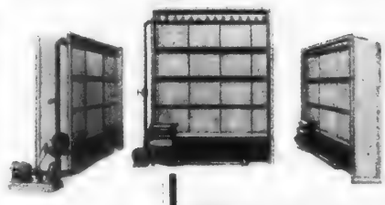
By installing "Buffalo" Heating and Ventilating equipment in the Title Insurance building in Los Angeles, the architects and engineer have expressed their confidence in "Buffalo" Fans. Branch offices in all principal cities will gladly cooperate with you on your heating and ventilating problems.

Buffalo Forge Company, 480 Broadway, Buffalo, N.Y.

In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

1878 "Buffalo" 1928 — "Air Engineers for Fifty Years"

Make Performance Records the Basis of Air Filter Selection



Typical installation of small G.A.F. Automatic Filters. 3 Units at the Manufacturers & Traders Trust Co., Buffalo, N. Y. Total capacity —50,000 C.F.M.

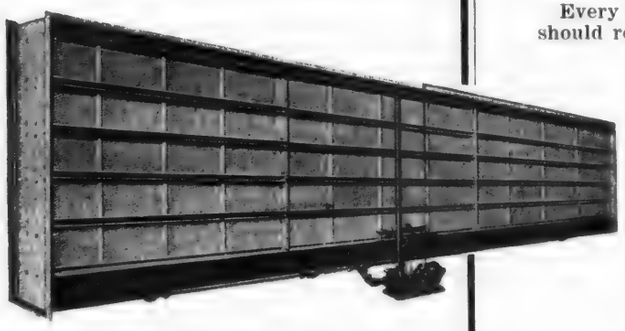
Any Architect or Engineer who studies the specifications of the G. A. F. Automatic Air Filter, cannot fail to recognize that from the theoretical standpoint, this filter is the ideal air cleaning device in that **it cleans the air with the highest practicable efficiency and rids itself of the accumulated dirt, all without requiring any human aid or attention whatever.**

Any Architect or Engineer who goes to see the G. A. F. Air Filter in operation and talks to users cannot fail to learn that, from the practical performance standpoint, this filter invariably fulfills the exceptional promise of its specifications.

Just recently the G. A. F. Filter has been selected for the two largest air-cleaning projects of modern times, the latest having a capacity for cleaning over 1,500,000 cubic feet of air per minute. Selection in each case was made on comparative performance records as obtained first-hand by the interested parties. Performance records invariably favor the G. A. F. Filter.

Every Architect, Engineer, Contractor and Business Executive should read the new descriptive catalog which brings out clearly the reasons which have established the G. A. F. Filter, **—the 100% automatic air filter—** in its present position of **LEADERSHIP.**

A copy will be sent on request. ***Write for one*** today.



Typical large G.A.F. Automatic Air Filter installed at the Lincoln Hotel, one of the newest and largest in New York. Normal capacity of this unit is 105,000 C.F.M.

General Air Filters Corp.

Division The W. B. Connor Co. Inc.

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The DURIRON COMPANY DAYTON·OHIO

WING FEATHERWEIGHT

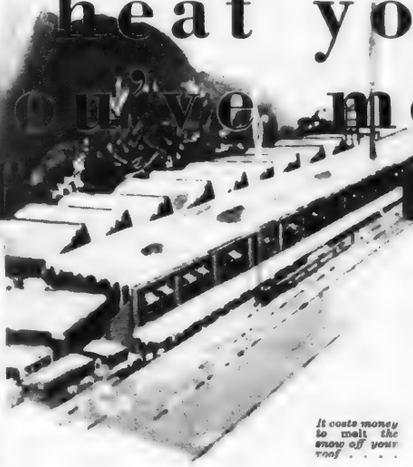
Winter mornings!

Can you heat your plant before you've melted the snow off the roof?

WITH most heating systems you can't! Except in spots close to the heating units, where it is uncomfortably hot. With Wing Featherweight Unit Heaters *you can.* Here's why—

Air heated at the floor level naturally rises. In the morning when you turn the steam on full, to heat up your plant, the air everywhere in your building is cold. As the air is heated it rises and cold air descends to take its place. It is only after all overhead air is very hot that enough warm air comes down from above to warm the workmen who are not uncomfortably near the steam coils.

The colder it is outside the longer it takes to heat this space overhead because heat is being conducted off rapidly through your roof. It takes even more time and costs more money when there is snow on your roof.



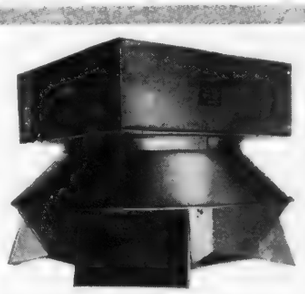
It costs money to melt the snow off your roof . . . .

Wing Featherweight Unit Heaters have been scientifically designed to correct this condition. They are located overhead. They circulate warm air through your building by means of the wonderfully efficient Wing Scruplex Fan. They prevent the accumulation of highly heated air under the roof by using this overhead air—reheating it in their featherweight steam coils, and directing it downward so that it mixes with the cooler air beneath. You feel the effect of Wing Heaters *immediately* in the morning.

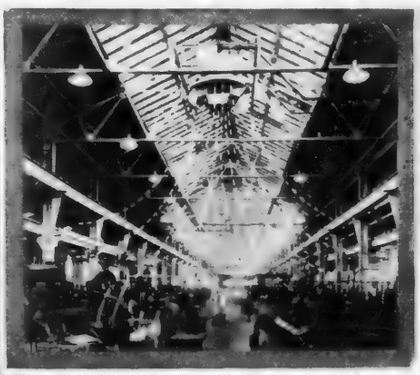
Wing Heaters are the most effective and economical made—

1. They distribute heat evenly through your building—keeping up a continuous healthful circulation of air.
2. Their heating effect is felt immediately.
3. They are featherweight. They can be installed overhead without reinforcement in any type of building.
4. They can be regulated independently of each other.
5. Since they circulate all the air they heat, they don't waste steam.

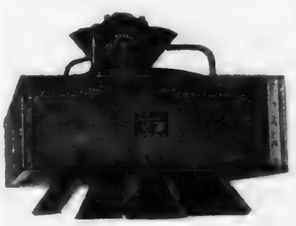
Be sure to study the Wing system before deciding on a heating system for your plant. Our new catalog explains in detail. Send for it.



Wing Featherweight
Low Ceiling Type



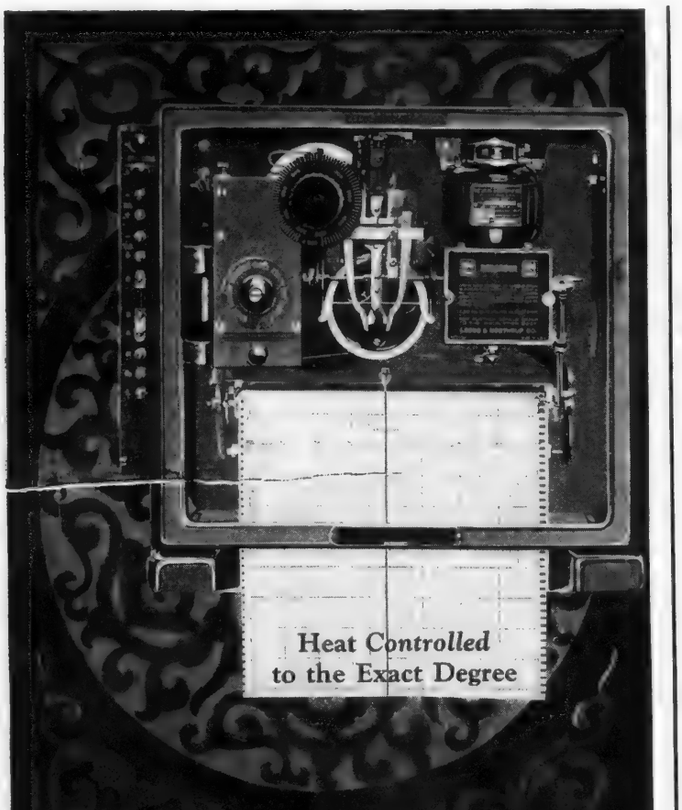
Warm currents directed downward at an angle mix quickly with floor-level air.



Wing Featherweight
High Ceiling Type

L. J. WING MFG. CO. 158 W. 14th Street New York, N. Y.

UNIT HEATERS



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Piece by piece, month after month the annealing of Wolverine tubing is held to an absolute standard—by modern furnaces and a vigilant laboratory.

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THE DESIGN OF GRAVITY-CIRCULATION WATER HEATING SYSTEMS, by F. E. Giesecke, Ph. D. A book, remarkable for its conciseness and clearness of expression, which contains the essence of the information needed for the proper design of gravity water heating systems, based on the principle that the frictional resistance must equal the force maintaining flow. The importance of the presentation is evidenced by the fact that the entire water heating section of the A. S. H. & V. E. Compendium of Modern Practice has been discarded and replaced with a new section by Doctor Giesecke, embodying the methods here presented in detail. 64 pages of text and 10 pages of tables and charts. Price, $3.00.

PLUMBERS' HANDBOOK, by Samuel E. Dibble. This work contains valuable data for the heating engineer and estimator, architect, building contractor and sheet metal worker, as well as for the plumber. Each subject is treated by a specialist, the section on Pipe Standards and Pipe Dies by F. N. Speller and that on Heating by Alphonse A. Adler. Size 4 x 7 in. 629 pp. 316 ills. Cloth, $4.00.

HOUSE HEATING WITH OIL FUEL, by P. E. Fansler, Associate Editor of The Heating and Ventilating Magazine. Prepared for the use of heating and ventilating engineers, heating contractors and those engaged in the oil-burner industry. One of the outstanding features of the book is the presentation of the subject of oil combustion. Over a dozen beautiful and spectacular flame photographs were made particularly for this book in order that the subject of oil combustion might more thoroughly be presented. Three chapters are devoted entirely to the discussion of salient points of the outstanding oil burners that are on the market to-day. The chapter, "Oil Burners Listed by the Underwriters," is the only authentic, chronological list of oil burners that has been listed by the Underwriters in the past. 32 chapters totaling 362 pages and more than 150 illustrations. Size 7 x 10. Price, $4.00 postpaid.

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THE HEATING and VENTILATING MAGAZINE
386 FOURTH AVE., NEW YORK

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Heating and Ventilating Units

Are you familiar with the latest improvements in heating and ventilating units? Many important new features have been developed for PeerVent machines during the past several months. **Be sure to investigate these features** before you buy or recommend a unit system of heating and ventilating.

Adjustable motors are now standard equipment on PeerVent Units. Each unit can be set to deliver the exact C.F.M. capacity required. If the C.F.M. requirements change at any time, the C.F.M. capacity of the unit can be changed accordingly.

PeerVent Units, equipped with adjustable motors, are truly **silent.**

Bear in mind, too, that PeerVent Units can now be equipped with the PeerTherm Control as an integral part of the unit. This device controls the fresh air damper.

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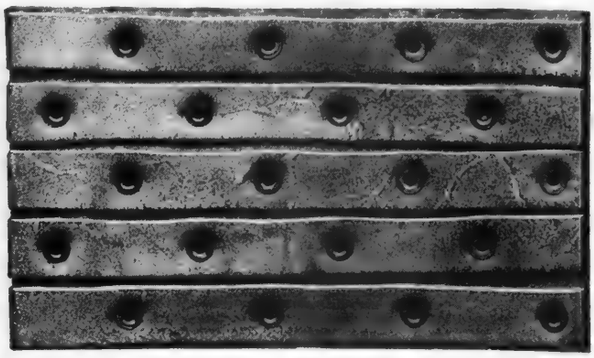
HEATING AND VENTILATING UNITS

Beware of Substitutes

THE SUCCESS OF "TENTACULAR"

has induced some enterprising persons to present to the trade some inefficient substitutes for the original "TENTACULAR" TRANSMISSION BELT.

Various failures of such substitutes, attempting to operate under the same conditions as "TENTACULAR", have reflected unfavorably on the latter, due to a vague resemblance creating confusion in the mind of the public.



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VENTILATING IXL SYSTEM

Quiet *Electric Ventilator*

An electric ventilator that fills a long felt need—efficient and quiet in operation.

Easy to install—requires no tearing down of walls or ripping of floors.

Write for catalog.

LAKESIDE COMPANY, 107 Main St., Hermansville, Mich.

CONTROL THE SPEED

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REGULATE WARM AND COLD AIR VOLUME

WITH THE TIME TESTED

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VARIABLE SPEED

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Carrier AIR CONDITIONING AND DRYING EQUIPMENT

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See our detailed data in A. S. H. & V. E. Guide.

Literature on request. Write concerning your specific problem.

A UNIT VENTILATOR
"should be seen but not heard!"

. . . Stand but three feet from a Sturtevant Silent Unit Ventilator—even in a quiet classroom—and you can detect not the slightest operating sound.

Outdoor air, filtered clean and warmed to any desired temperature enters the room unannounced as it were, stealing comfortably around the children. No air movement is noticeable. Drafts or overheating is impossible.

A feature of Sturtevant Unit Ventilation is the ease with which the temperature of each individual room may be controlled . . . A turn of the wrist is all that is required.

For sixty-four years Sturtevant products have stood for all that was sturdiest and best in design and construction. Sturtevant Unit Ventilators represent the very best that engineering skill, long experience and painstaking craftsmanship can produce.

Our new Catalog—No. 361—contains the pertinent facts . . . We shall be glad to mail you a copy.

B. F. STURTEVANT CO., Hyde Park, BOSTON, MASS.
Branch Offices in Principal Cities
Canadian Offices at: Toronto, Montreal and Galt
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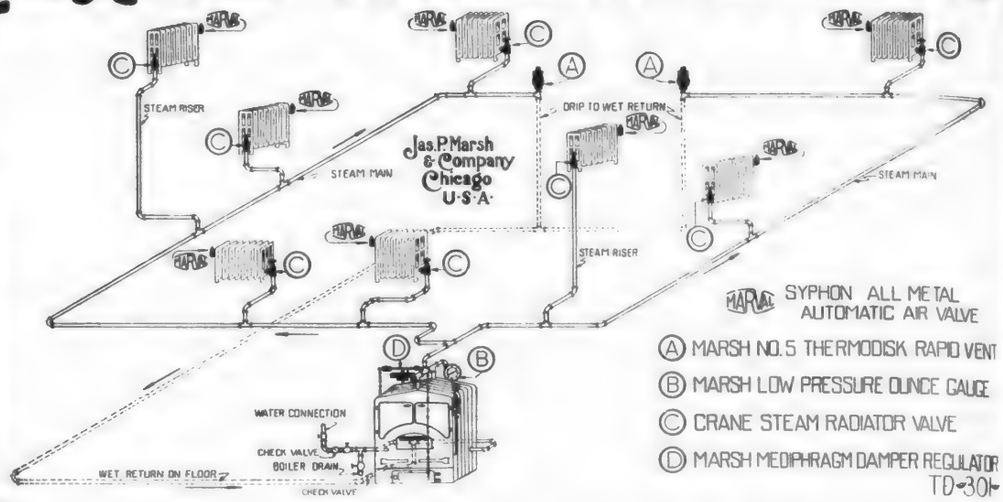
MARVAL Syphon Automatic Air Valve



MARVAL SYPHON ALL METAL AUTOMATIC AIR VALVE

Ⓐ MARSH NO. 5 THERMODISK RAPID VENT

Ⓑ MARSH LOW PRESSURE OUNCE GAUGE

Ⓒ CRANE STEAM RADIATOR VALVE

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The MARVAL Syphon Automatic Air Valve is a popular priced, efficient and thoroughly dependable all-metal factory adjusted Valve.

Vents all the air quickly—and at all temperatures Steam circulates through the entire radiator.

Closes by thermostatic action for steam—no hissing, spitting annoyance.

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Made of Heavy Steel

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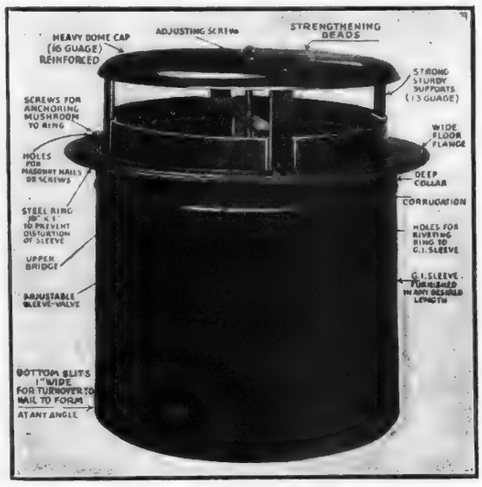
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ADJUSTING SCREWS
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SCREWS FOR ANCHORING MUSHROOM TO RING
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HOLES FOR MASONRY NAILS OR SCREWS
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CORRUGATION
STEEL RING TO PREVENT DISTORTION OF SLEEVE
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UPPER BRIDGE
ADJUSTABLE SLEEVE-VALVE
G.I. SLEEVE FURNISHED IN ANY DESIRED LENGTH
BOTTOM SLITS 1" WIDE FOR TURNOVER TO NAIL TO FORM AT ANY ANGLE

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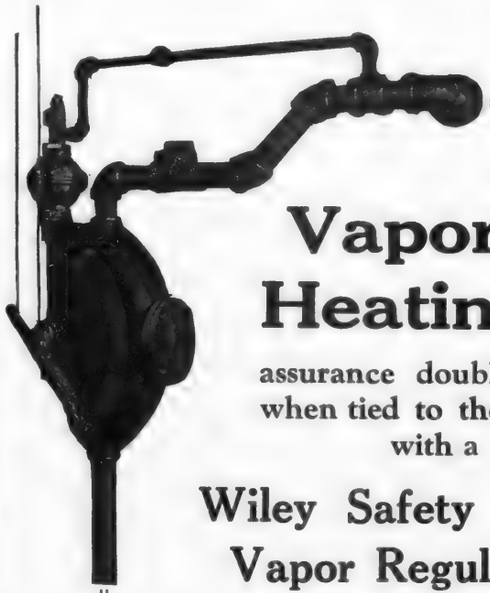

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assurance doubly sure when tied to the boiler with a

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Write for your copy of booklet describing the Wiley line of vapor heating specialties.

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—maximum air delivery against low or medium high resistance from a minimum of housing; construction as equally adaptable to high as to low pressures and as practicable for double as for single width fans.

— strong, yet light, quietness in operation; mechanically of the highest obtainable efficiency.

— blast wheel of net-work or plexiform construction to provide maximum strength from the minimum of material weight.

—large and unobstructed inlets and outlets; small housings.

—blast wheel construction on a balanced center and built up with parts of uniform weight and gauge, thus making the blast wheel, when assembled, in balance.

The Plexiform Fan—light, easy running, low operating cost. Made in various sizes and types for engine, motor or line shaft drive.

That briefly is the Bayley concept of an efficient centrifugal fan and the manner in which the Bayley Plexiform Fan is built. Scores of installations have proven it successful. May we tell you where they are and state the argument more fully by means of our Bulletin No. 26.

BAYLEY BLOWER COMPANY

742 Greenbush Street Milwaukee, Wis.

Bayley

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HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS—PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS

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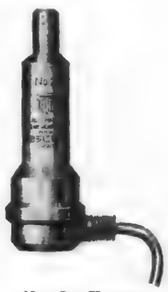
⅛ in. Side-Outlet Air Valve for Radiators

No. 3
¼ in. Bottom-Outlet Air Valve for Mains, Coils and Risers

No. 7
¾ in. Bottom-Outlet Quick Vent Air Valve for Mains and HV Stacks will not close against water



No. 2—Vacuum
⅛ in. Side-Outlet Air Valve for Radiators

No. 4—Vacuum
¼ in. Bottom-Outlet Air Valve for Mains, Coils and Risers

No. 5
⅜ in. Bottom-Outlet Quick Vent Air Valve for Mains and HV Stacks

This complete line of KELLY NON-ADJUSTABLE AUTOMATIC STEAM AIR AND VACUUM VALVES is manufactured complete by the Kelly Brass Works.

KELLY valves are made to give entire satisfaction and are the result of over 35 years' experience.

The outer shell of the valve is threaded into a drop forged brass base and the valves are substantially constructed of the best grade of materials.

KELLY valves are subjected to practical steam and vacuum tests before shipping and are GUARANTEED FOR FIVE YEARS when installed and operated under proper conditions.

KELLY BRASS WORKS

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No. 6—Vacuum
⅜ in. Bottom-Outlet Quick Vent Air Valve for Mains and HV Stacks

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TRADE MARK

Controlled Fresh Air

Getting enough fresh air without drafts is a difficult problem without the proper ventilation. The Turtleback Air Diffuser is designed to admit air with greater velocity, maintaining a constant flow, without discomfort to those in the immediate vicinity.

The amount of fresh air may be closely regulated with only one screw in center of top to manipulate. There are no parts that may become loose or rattle. The Turtleback is made entirely of cast-iron, which will withstand unusual wear and abuse. Easy to install and economical because there are no replacements. *Write for illustrated catalog.*

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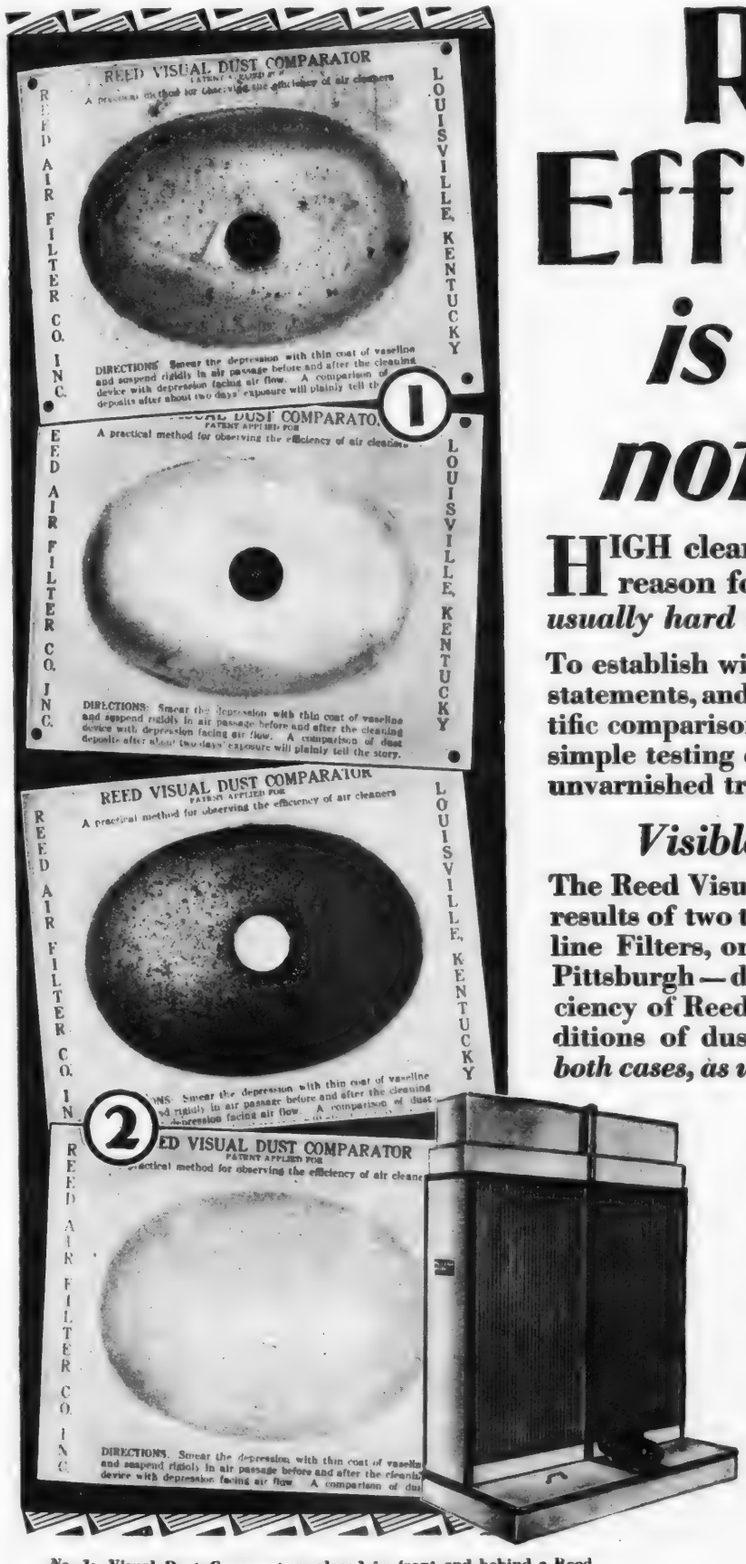
975-993 Dean Street **BROOKLYN, N. Y.**


REED VISUAL DUST COMPARATOR
PATENT APPLIED FOR
A practical method for observing the efficiency of air cleaners
DIRECTIONS: Smear the depression with thin coat of vaseline and suspend rigidly in air passage before and after the cleaning device with depression facing air flow. A comparison of dust deposits after about two days' exposure will plainly tell the story.
REED AIR FILTER CO. INC.
LOUISVILLE, KENTUCKY
1
2

No. 1: **Visual Dust Comparators placed in front and behind a Reed Streamline Air Filter in Minneapolis.** *No. 2:* **Comparators similarly exposed in a Streamline test in Pittsburgh.** *Efficiency—better than 97%.*

Reed Efficiency *is* FACT- *not claim!*

HIGH cleaning efficiency—the one and only reason for air filters—is easy to claim, ***but usually hard to prove.***

To establish without question the accuracy of Reed statements, and to furnish a means of making scientific comparisons, Reed engineers have developed a simple testing device for the use of anyone desiring unvarnished truth about filter efficiencies.

Visible, TANGIBLE *Proof!*

The Reed Visual Dust Comparators at left show the results of two typical efficiency tests on Reed Streamline Filters, one in Minneapolis and the other in Pittsburgh—demonstrating the high cleaning efficiency of Reed Air Filters even under extreme conditions of dust-concentration. ***Proven efficiency in both cases, as with all Reed Filters—better than 97%.***

Send for Your Comparators

Reed engineers invite such tests on Reed Filters. It will pay you to *know* the real efficiency of your filter—present or prospective. Use the coupon for getting your Comparators. Reed Air Filter Co., Incorporated, 218 Central Ave., Louisville, Ky.

Offices in Principal Cities

Reed Air

TRADE *filters* ALL METAL MARK

Use This

REED AIR FILTER CO., ***Incorporated***
218 Central Ave., Louisville, Kentucky

Send, without obligating us, two Reed Visual Dust Comparators with instructions for use, also full information on the Reed Streamline Air Filter—*guaranteed efficiency, 97% to 99%.*

Name..... **City**.....

Company..... **State**.....

Fig. 853 Low Bonnet Angle Radiator Valve, male union.

'64—and 64 more!

The year of '64 saw the Jenkins Valve put on the market. 64 more years have passed and the Jenkins Valve is more firmly established than ever in the favor of engineers in all industries and valve users in every part of the country.

In the year-by-year building up of confidence and strengthening of a national reputation, rigidly high standards have played an important part. Metal for Jenkins Valves is proved by analyses before and after casting; the design provides strength in every detail. The finished valve before it leaves the Jenkins factory must pass a wide margin test under severe conditions.

There are Jenkins Valves for practically every plumbing and heating requirement, obtainable through supply houses everywhere.

JENKINS BROS.
80 White Street.....New York, N. Y.
524 Atlantic Avenue.....Boston, Mass.
133 No. Seventh Street.....Philadelphia, Pa.
646 Washington Boulevard.....Chicago, Ill.

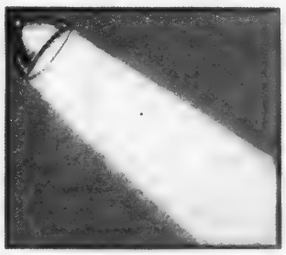
JENKINS BROS., LIMITED
Montreal, Canada London, England

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

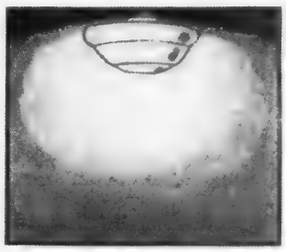
A Jenkins Job

The Title Insurance and Trust Co., Los Angeles, Calif., is equipped with Jenkins Low Bonnet Radiator Valves, in the new chromium finish.

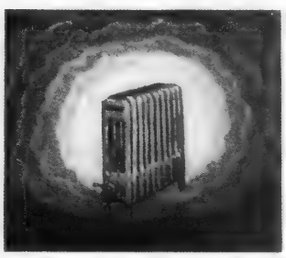
No "Spotlight" Or Scorched Air Heating With Clow Gasteam Radiators



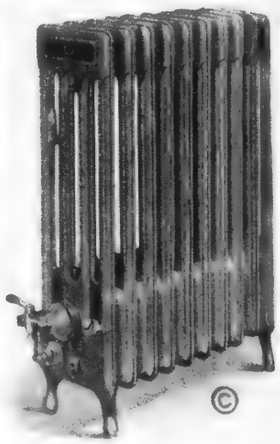
A spotlight. The way some heating fixtures operate. Fierce heat on spot. Cold areas elsewhere.



A diffused office light. Illustrates the way Clow Gasteam Radiators *radiate* heat. Rays are thrown to every part. All areas within a reasonable distance are equally heated.



The way Clow Gasteam Radiators give off heat. They don't hug heat to one small scorched area or throw it on one spot.



A spotlight is all right for certain purposes. But you can't make a room comfortable with "spotlight" heating.

Another point: heating a small volume of air to very high temperatures—scorched air heating—results not only in very faulty heat distribution, but the quality of air in which human beings must live is greatly impaired.

There's no spotlight, or scorched air heating with Clow Gasteam. Clow Gasteam means *steam* heat, radiated in every direction — downward, upward and sideways. Clow Gasteam heats a very large volume of air to medium, healthful temperatures.

Heating with Gasteam Radiators doesn't result in frigid zones and torrid zones, both in the same room—at the same time. Floors as well as ceilings are warm — the farthest corner as comfortably warm as next to the radiator—when rooms are heated with healthful, comfortable Clow Gasteam Radiators.

JAMES B. CLOW & SONS
201-299 No. Talman Ave., CHICAGO

CLOW GASTEAM

National Air Filters
for HIGH *Efficiency*
MEDIUM *Capacities*
LOW *Cost*

Either the TooPas or the AIRMAT filter will solve any air filtering problem for average installations at reasonable cost.

AIRMAT

The original dry process filter

This filter uses a dry fibrous textured mat as the filtering medium. It is built in sections, permitting the greatest flexibility in capacity and installation. AIRMAT filters are very easy to install. They can be serviced without soiling the hands—just put in a new mat like you would change a desk blotter.

First cost is low.
Space is conserved.
No "extras" required.
Maintenance cost low.
Efficiency high.

TOOPAS

Works like the time tested Phoenix

The TooPas filters the air twice on the viscous film principle of cleaning air. It presents the advantages of the long established Phoenix Filter, but in a new type of sectional construction which is economical to build and install. Built in units of standard width and any required height, it can be made to fit any size wall openings.

Air is twice filtered, assuring high efficiency.
Endless curtain filtering medium.
No oil entrainment.
Immersion principle of cleaning.
Sections or units easily installed.
Easily serviced, with or without motor drive.
New in mechanical construction.

Both filters built on quantity production basis.

Send for our valuable, bound set of bulletins on air filters. Sent without obligation to interested engineers, architects, and contractors.

NATIONAL AIR FILTER COMPANY NATIONAL

5130 Ravenswood Avenue, Chicago, Illinois

H&V11 Gray

BRYAN BOILERS

for

Oil and Gas Only

Throw away your shovel!

Who likes to shovel coal anyway? This disagreeable job is first shifted from Dad to Mother, to eldest son .... and finally in desperation it is decided that the neighbor's small boy needs a chance to earn some pocket money. This arrangement is fine for a short while, then .... another change is necessary.

.... This, or a similar situation exists in thousands of American homes, and has been the cause for the rapid rise of oil as a fuel for house heating. Consider for a moment the vast selling possibilities which the BRYAN BOILER offers. Here is a product which eliminates all of the above evils, and, at the same time, guarantees economical oil consumption. The Bryan dealer franchise offers an opportunity for the dealer to cash in on the demand for modern heating appliances.

Investigate our dealer proposition—TODAY!

BRYAN STEAM CORP.
[Boiler Division]
PERU INDIANA

Better Built B-J Vapor Valves

Applicable to Every Type of Heating

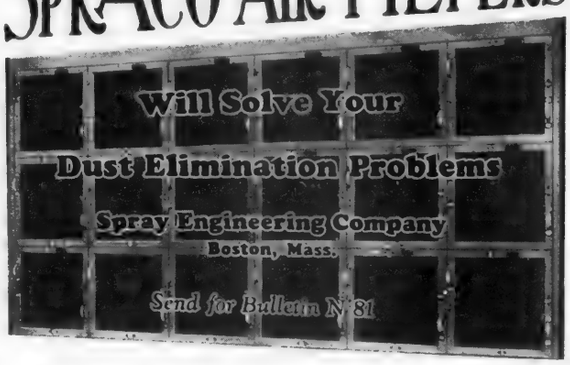
Barnes & Jones Heating Systems, either Vapor or Vacuum, are applicable to every heating problem from the smallest house to the largest office building. They have many special advantages in construction and design which have been developed as a result of 30 years experience with steam heating problems.

Barnes & Jones

Modulation Vapor and Vacuum Heating Systems of Proven Quality

128 Brookside Ave., Jamaica Plain, Boston
101 Park Avenue, New York City

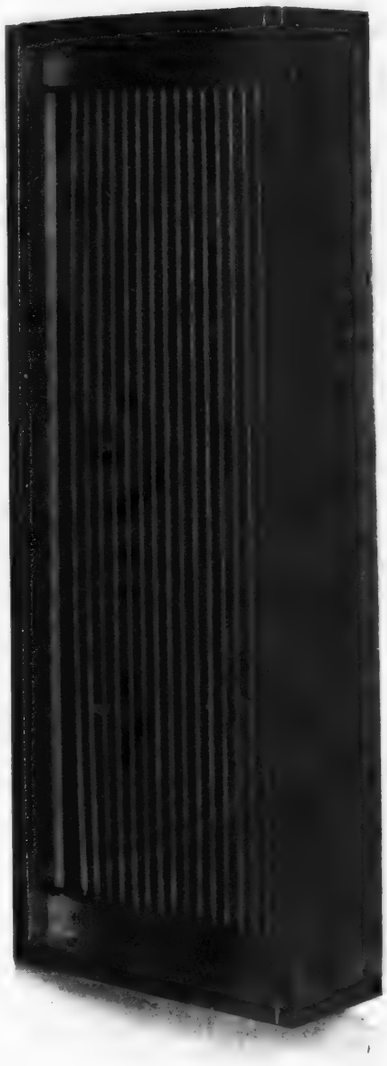
SPRACO AIR FILTERS



PHILLIPS **Self-Drilling Expansion Shells**

A quick and permanent fastening in concrete walls, ceilings, floors, beams and columns. Have internal U. S. Standard threads for rods, bolts and screws. No drills required. Quickly installed by hand or with Phillips Spring Hammer.

Phillips Drill Company
1537 Cortland St., Chicago



AEROFIN

the original non-ferric Fan System Heat-Surface, combining light-weight with compactness and adaptability with encased unit design=

is clearly proved the preference of progressive Architects and Engineers by the fact that in the short five years since AEROFIN was made available to them they have specified and installed more than

eleven million feet of it!

Complete information, together with proved Piping Diagrams, will be sent promptly upon request. Ask for Bulletin No. 8, LOW PRESSURE AEROFIN and/or Bulletin H.P.-2, HIGH PRESSURE AEROFIN.

Whatever you've wished for in a Fan System Heat-Surface you'll find in Aerofin!

AEROFIN CORPORATION

Burnham Building
CHICAGO

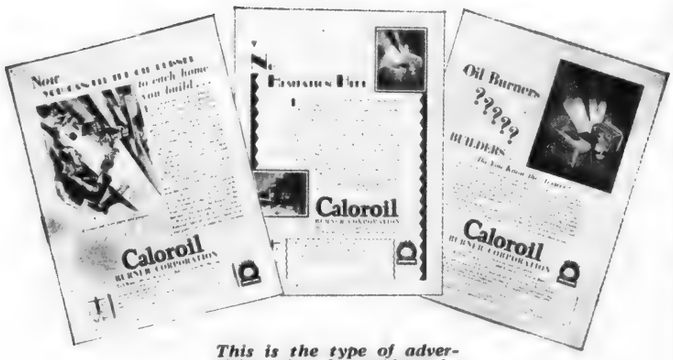
850 Frelinghuysen Avenue, NEWARK, N. J.
39 Cortlandt Street, NEW YORK
Land Title Bldg., PHILADELPHIA

Oliver Building
PITTSBURGH

LOW PRESSURE AEROFIN
For pressures up to 50 lbs.
Tube-plate Construction

[*Aerofin is sold only by Manufacturers of nationally advertised Fan Heating Apparatus*]

HIGH PRESSURE AEROFIN
For pressures from 25 to 350 lbs.
Continuous Seamless Tubes



This is the type of advertising that is making the public Caloroil conscious

MANSIONS and COTTAGES *Have different* HEATING NEEDS

HOW difficult it is to sell the same burner to both. The demand for oil *heat* is wide. The market is large. And no *one* burner can supply every type of prospect. But with the Caloroil *line* you can logically offer burners for everyone.

Meet every requirement—whether for low first cost, high operating efficiency, silence, or any other *burner* characteristic—with the well-advertised, well-known, well-sold Caloroil line.

Get the details of the unusual Caloroil franchise, territorial protection, and sales policies.

Only high-class, experienced business men are sought. If *you* measure up, you will find the Caloroil proposition all you could ask. Write or wire today.

Caloroil

BURNER CORPORATION

225 West 34th St., N. Y. C.

HEAT IS LIFE

CALOROIL BURNER CORP.,
Dept. 10, 225 West 34th St., N. Y. C.

Tell us about the Caloroil Line of Burners—and the franchise you offer.

Name.....

Address.....

MEMBER OIL HEATING INSTITUTE OIL HEAT

This is our "18" Series boiler of six sections. The "18" is especially designed to secure for the small home the same structural advantages and fuel economy found in the larger series. Peerless Super Section Boilers are made for all sizes of installations.

The Peerless Policy *Protects the Dealer*

—by use of the best materials and workmanship in building every boiler.

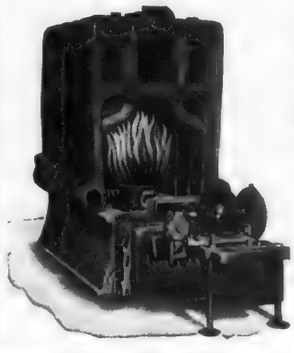
—by careful testing and assembly of each boiler.

—by honest ratings fully guaranteed.

—by a guarantee on performance, as well as a guarantee on workmanship.

—and finally by a sound sales policy that is fair to the whole heating trade.

Attractive prices and prompt delivery – mail a postal today for price sheet and catalog.



The PEERLESS HEATER COMPANY

Boyertown, Penna.

Plenty of heat absorbing surface gives economical results when burning oil in a Peerless. There isn't a better boiler for an Oil Burner Installation.

Specify Rome Helicalfin Tubes

for Air Heating and Cooling Equipment

Maximum Radiator Service
Lowest Air Friction Loss
Complete Line of Sizes

Flat continuous radiating fin—no corrugations.

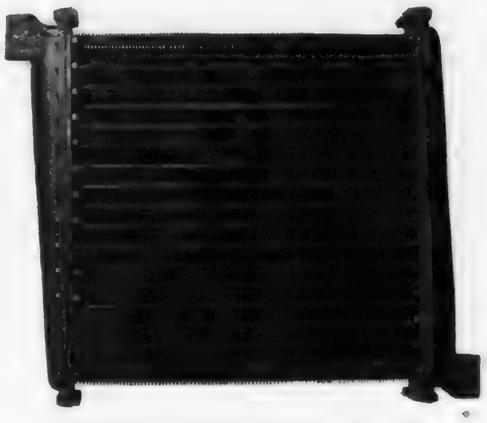
Quantity production.

Small sizes for refrigeration condensers, oil coolers, etc.

Medium sizes for unit heaters and blast heating and ventilating systems.

Large sizes, ends threaded for bathroom heaters, direct factory heating and concealed direct radiation.

Furnished ready for installation, with guards if desired.

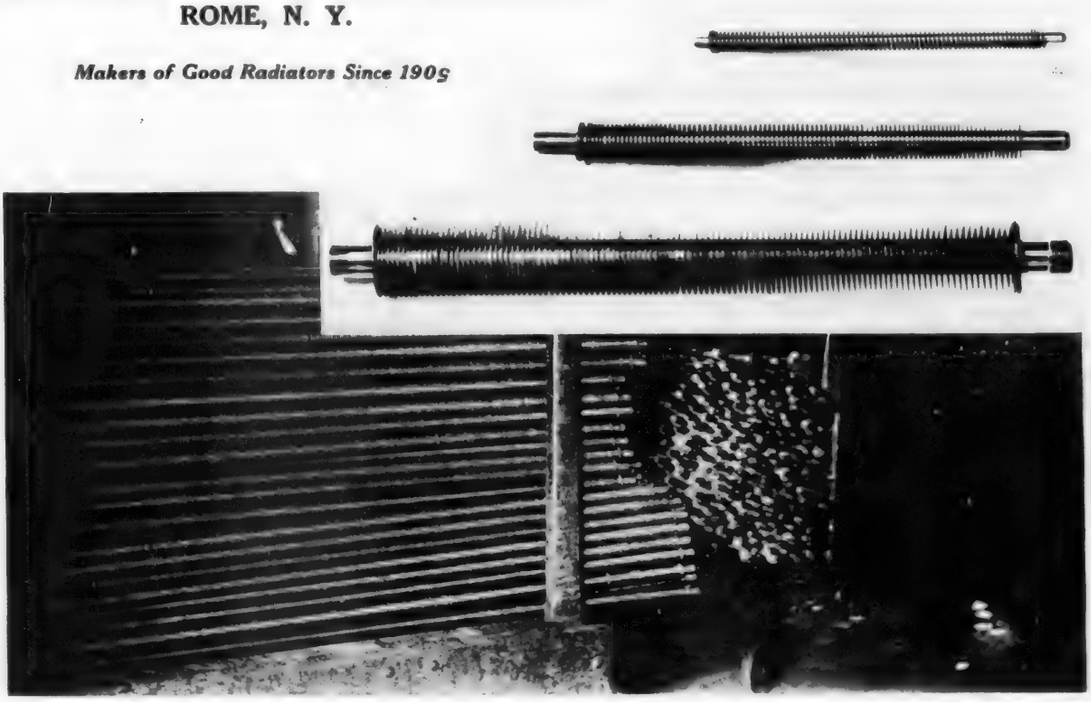


Seamless Copper Construction

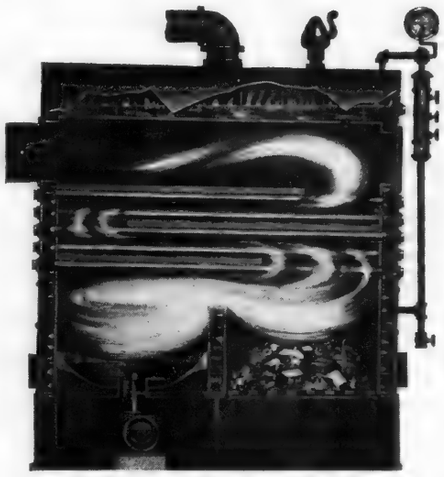
Engineering data covering the performance of Rome HELICALFIN Heaters has been prepared by a nationally known test engineer and is available upon request.

ROME-TURNEY RADIATOR COMPANY
ROME, N. Y.

Makers of Good Radiators Since 1905



Mail This Coupon Today for Oil Fuel Boiler Data!



NOW is the time. Don't delay in getting posted on JOHANSON, The Combination Triple Service Boiler. Its TRIPLE SERVICE means:

1—HEAT FOR BUILDING.
2—YEAR 'ROUND DOMESTIC HOT WATER.
3—GARBAGE INCINERATION.

By fullest possible heat utilization it guarantees the most economical operation.

The domestic hot water all year 'round saves extra equipment, fuel costs, space and maintenance costs.

Finally, garbage incineration is an added service and convenience at no added expense of an incinerator.

In a series of unbiased tests conducted by Accredited Engineers of the Armour Institute of Technology, Chicago, JOHANSON, The Triple Service Boiler made this remarkable record:

A 1250 ft. size (steam) boiler, fired by an oil burner of standard make, operating at 102.4% of its rated capacity, developed—

Over-all Efficiency	81.92%
Average CO_2	11.6 %
Quality of Steam	99.45%
Average Stack Temp.	352.4°

TRIPLE SERVICE COMBINATION BOILERS — COMBINATION TRIPLE SERVICE BOILERS

Send in The Coupon Today. We'll Do The Rest.

COMBINATION BOILER CO., Benton Harbor, Mich.
Please send data and full information on your boiler.

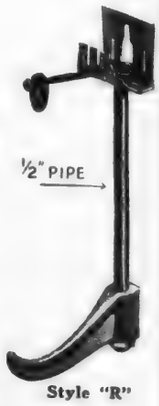
Name.....

Address.....

City.....State.....

E-Z

Radiator Hangers



Designed to meet all building conditions and will fit any type of wall construction whether of frame, concrete, brick or hollow tile.

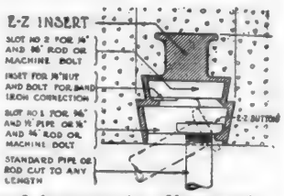
USE THEM ON YOUR NEXT JOB IMMEDIATE SHIPMENT

MADE FOR ALL TYPES OF TUBE RADIATORS

Style "R"

E-Z CONCRETE INSERTS

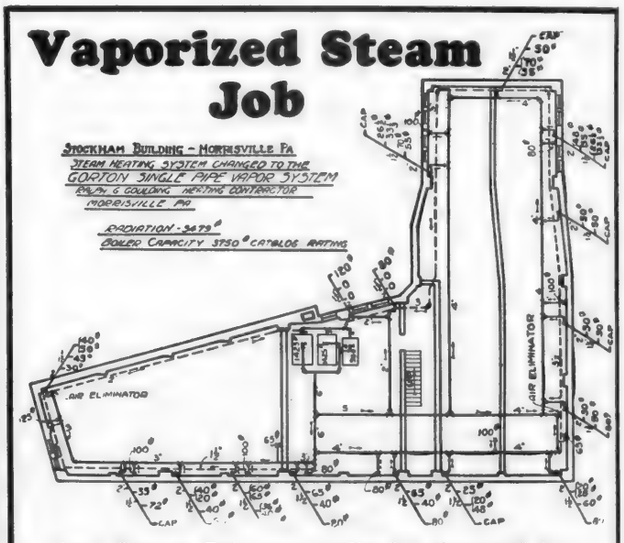
One Size for All Pipe Hangers


E-Z INSERT
SLOT NO 2 FOR ⅜" AND ½" ROD OR MACHINE BOLT
INSET FOR ⅜" NUT AND BOLT FOR BAND IRON CONNECTION
SLOT NO 1 FOR ⅜" AND ½" PIPE OR ⅜" AND ½" ROD OR MACHINE BOLT
E-Z BUTTON
STANDARD PIPE OR ROD CUT TO ANY LENGTH

ONLY one size needed for all pipe hangers. Ball and socket connection between insert and hanger. Fully adjustable — allows play to overcome expansion and inaccurate alignment of inserts. ***E-Z Button turns in the insert—no couplings or turn-buckles needed.*** **Write for details and prices.**

HEALY-RUFF CO.
772 Hampden Ave. St. Paul, Minn.

Vaporized Steam Job


STOCKHAM BUILDING - MORRISVILLE PA
STEAM HEATING SYSTEM CHANGED TO THE
GORTON SINGLE PIPE VAPOR SYSTEM
RALPH G. GOULDING HEATING CONTRACTOR
MORRISVILLE PA
RADIATION - 3679 SQ FT
BOILER CAPACITY 3750 SQ FT CATALOG RATING
AIR ELIMINATOR
AIR ELIMINATOR

Any Steam Job can easily be changed to a Gorton Single Pipe Vapor System at a low cost by using most of the present equipment with Gorton Vapor Specialties.

We will gladly give further information about the Stockham Job or the VAPORIZING of any steam job you have in prospect —No obligation.

Engineering Department

Gorton Heating Corp.
96 Liberty Street New York, N. Y.

Have you received Vapor Catalog No. 93?

75 Horse Power Century 60-Cycle 440 Volt 900-R.P.M.
3-Phase Squirrel Cage Induction Motor

This 75 Horse Power **Century 60-Cycle 440 volt 900 r. p. m. 3 phase Squirrel Cage Induction Motor is a general-purpose motor with high performance characteristics.... It is thoroughly ventilated, well protected, and can be easily cleaned with an air nozzle. It is liberally designed with all active materials properly allocated—strong and rigid to withstand the strain of gear and chain drives.**

The motor illustrated is equipped with double-row roller bearings, which are interchangeable with double-row ball bearings.

Century 3 and 2 Phase Squirrel Cage Induction Motors are built in standard sizes from ¼ to 200 horse power. Temperature rating, 40° C.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.
35 Stock Points in the United States and More Than 50 Outside Thereof

Century MOTORS

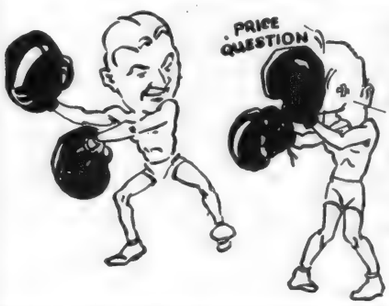
"THEY KEEP A-RUNNING"

Another Johnston Installation

The Johnston Oil-Burner-Boiler Knocks Out The High Cost Objection

After the prospect has been all warmed up to the advantages of automatic heat, isn't it what Sherman said war is, to have him say—"... but, of course, it takes too much fuel, it is too expensive to operate"—? You can knock this objection out in a hurry if you handle the Johnston-Oil-Burner-Boiler. You can show where the combination of your burner and the Johnston boiler will save from 25 to 50 percent on fuel costs year in and year out. Better write for the Johnston Catalogue and dealer proposition right away—it will pay you well.

JOHNSTON BROTHERS, Inc.
FERRYSBURG, MICHIGAN



The Johnston Oil-Burner-Boiler packs a big punch. It knocks out the price question and helps you get more names on the dotted line. Just mail the handy coupon and we'll send the whole story by return mail.

JOHNSTON BROS., INC.
Ferrysburg, Michigan.

Gentlemen:

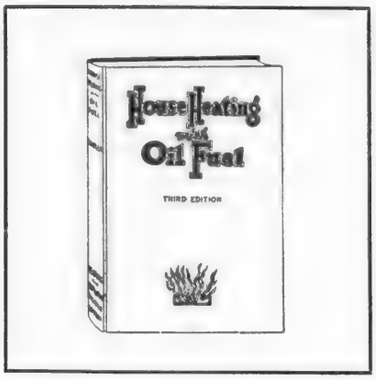
Tell us how the Johnston Oil-Burner-Boiler will help us knock out the price question, and sell more oil burners.

Name .....

Address .....

City..... State.....

HOUSE HEATING WITH OIL FUEL



THIS publication has been prepared for the use of the heating and ventilating engineer, the heating contractor, those engaged in the oil-burning industry, and the user and potential user of oil-burning equipment. Over a dozen beautiful and spectacular flame photographs were made particularly for this book in order that the subject of oil combustion might be more thoroughly presented.

A representative of one of the largest oil burner manufacturers writes us:

"I have just returned from a trip on the road and find copy of "House Heating With Oil Fuel" which I requested you to mail me here, and I herewith enclose order in payment of same. I have bought all available books published on oil burning during past seven years I have been connected with development work in the field, appointing dealers for oil burners, and there has been nothing yet that approaches this book. Every oil-burner dealer owes it to himself to have a copy. I will advise all of our dealers to get a copy of this book as an absolute essential."

MORE THAN 150 ILLUSTRATIONS

362 PAGES **PRICE, $4.00**

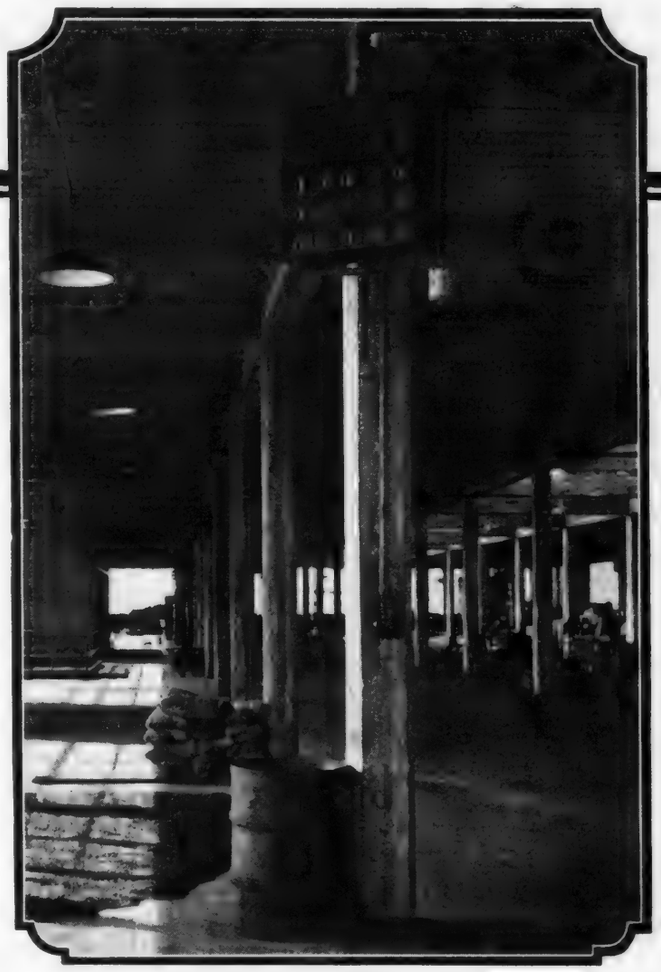
Published by

HEATING & VENTILATING MAGAZINE CO.

386 FOURTH AVE., NEW YORK CITY

Specify Armstrong Steam Traps

for draining heater units



UNIT heater installations are not complete and in condition to operate at maximum efficiency unless they are equipped with suitable Steam Traps. Provision must be made to drain the condensate and release the air from unit heaters—otherwise their effectiveness is greatly decreased.

Armstrong Traps are especially well suited for draining heating systems because they automatically discharge air with the condensate, and are water sealed at all times against the escape of live steam. They have a large capacity for their small size. Their low cost is due to the small size which also simplifies installation as no special fittings or supports are necessary.

Long life and trouble-free operation are assured by the careful construction of all parts and the use of wear resisting metals for the valves and seats.

Send for catalogs and full information on application to heating system.

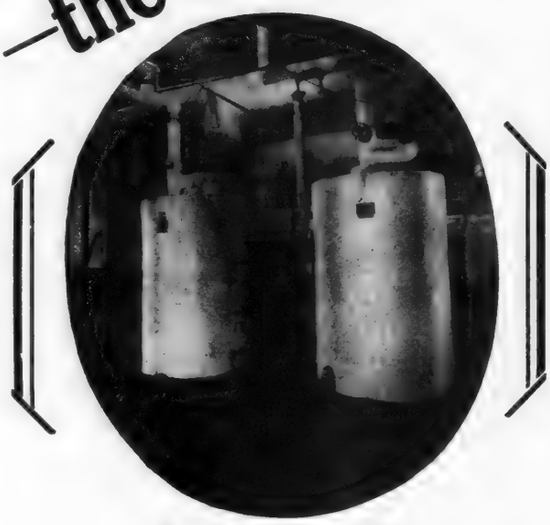
ARMSTRONG MACHINE WORKS

346 Maple Street, Three Rivers, Michigan

District Representatives in 36 Cities

H&V11-Gray

—the Deadline!



Two 20-H.P. Ofeldt Boilers Style A in a large newspaper plant—steam used for heating matrix tables.

Steam Helps Meet It

—There are numerous departmental "deadlines" in all industrial units—even as on a newspaper. A certain part of the work must be done at a specified time if the consumer is to get the finished product when he wants it. In the illustration above, you see two 20-horsepower Ofeldt Boilers used to heat the matrix tables of a large newspaper—so that the stereotypers may have a "mold" from which to cast the printing plates for the waiting presses. There must be no delay here: It is a "deadline" piece of work.

The Ofeldt Automatic Gas Fired Steam Boiler is the choice wherever process steam is needed quickly and in abundance. The "steam in 4 minutes" feature insures no delays, and the automatic regulation makes it possible to burn fuel only as steam is needed. The Ofeldt takes but little installation space, and can be placed close to the job. Easy to operate and requires no licensed engineer in the smaller sizes. It is clean and the operating efficiency is exceedingly high—and *it is always dependable.*

That is why the meets all process work "deadlines!" Built in 14 sizes.

"Steam in 4 minutes" Ofeldt

Our Literature Concerns all Process Steam Requirements—Write for it.

MEARS-KANE-OFELDT INCORPORATED

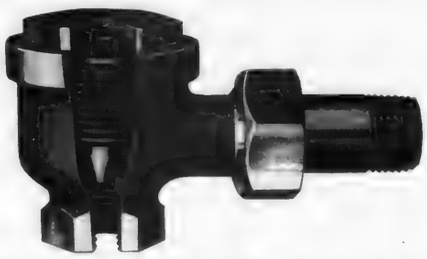
GAS FIRED BOILERS AND WATER HEATERS

1803-1915 EAST HAGERT ST., PHILADELPHIA

New York City, 9 Park Place
St. Louis, Mo., 2010 Locust Boulevard
Chicago, Ill., 363 W. Erie St.
Los Angeles, Cal., 940 S. Maple Ave.
Buffalo, N. Y., Walbridge Bldg.
Birmingham, Ala., American Trust Bldg.
Boston, Mass., 100 Arlington St.

THE No. 12 THERMOFLEX RADIATOR TRAP

with the PROOF-TESTED BELLOWS



Remember this when specifying and buying thermostatic traps!!! That while Thermoflex Traps are sold for low pressure vapor and vacuum heating systems, occasionally or accidentally subjecting them to steam pressures up to 100 lbs. *will not injure the bellows.* The hydraulic forming process which proof-tests the bellows to several hundred pounds internal pressure, eliminates any possibility of a defective bellows being assembled into a trap.

Let us tell you about Thermoflex Specialties

W. D. CASHIN COMPANY

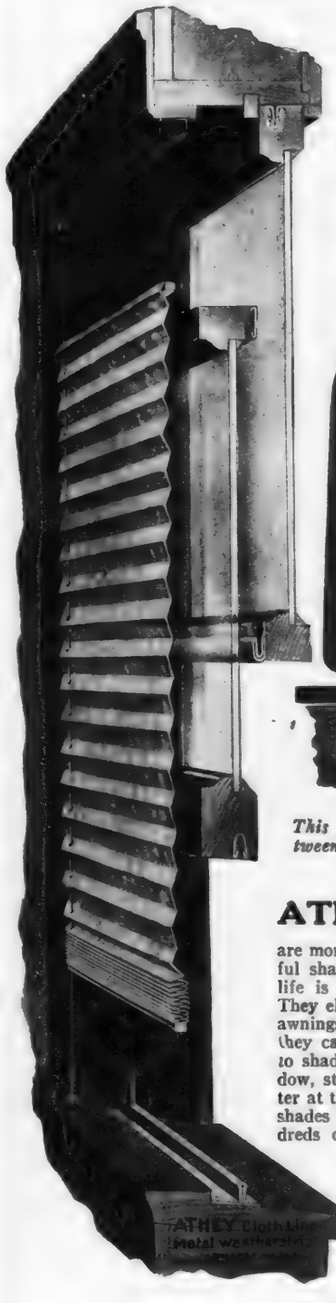
35 HARTFORD STREET BOSTON, MASS.

Distributors in
New York, Chicago, Philadelphia, Syracuse, Cleveland, Detroit, Charlotte, Washington, Hartford, Conn., San Francisco, Minneapolis, Pittsburgh, St. Louis

Send the coupon for facts about the latest thing in Heating
CONVECTO
Bath Room
RADIATOR
In great demand for the modern bathroom
—handsome, compact, efficient, profitable
METAL STAMPING CO. Established 1872 LONG ISLAND CITY, N.Y.
METAL STAMPING CO, LONG ISLAND CITY, N.Y.
Please send information on the Profit making Convecto Bath Room Radiators.
PIN COUPON TO YOUR LETTERHEAD

These Modern Buildings are draft-proofed

A FEW PROMINENT BUILDINGS ATHEY-WEATHERSTRIPPED
THERE ARE HUNDREDS OF OTHERS ALL OVER THE U. S. A.



Right now is the time

to draft-proof Buildings for the coming cold Winter. It is a profitable investment that pays more than 33% dividends annually for the life of the building.

4 times actual dimensions

This cloth insert makes a tight contact between metal and window frame.

SAVES FUEL—ADDS COMFORT

ATHEY Cloth-to-Metal contact weatherstrips change any wood or steel window from a rattling, loose, drafty sash to one that works smoothly and quietly and is absolutely draft-proof when closed. Why force the Heating Plant by trying to heat all outdoors when a simple ATHEY installation quickly pays for itself with the saving in fuel?

A prominent firm of New York architects made exhaustive tests of various well known mechanical devices for reducing air leakage through windows. They found the ATHEY cloth-lined metal weatherstrips were eleven times superior in reducing leakage over non-weatherstripped windows and more than four times as efficient as the best of other installations.

Send for this New Athey Book

It contains valuable information for any building owner or manager, architect or engineer, desiring to save fuel, prevent drafts and increase comfort.

ATHEY WINDOW SHADES

are more than the most beautiful shade obtainable and long life is not the only economy. They eliminate the necessity of awnings and are better because they can instantly be adjusted to shade any part of the window, still allowing light to enter at the top. These attractive shades have proved, in hundreds of prominent buildings, their unusual durability and dust and dirt-repellent qualities, besides their freedom from annoying catches and springs.

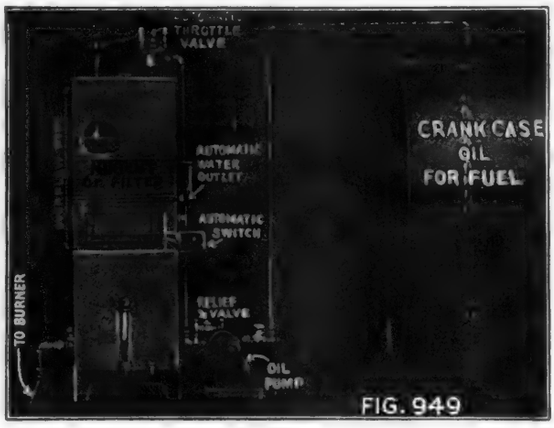
Athey

CLOTH LINED METAL WEATHERSTRIPS and PERENNIAL WINDOW SHADES

ATHEY COMPANY
6007 West 65th St., CHICAGO

Representatives in all Principal Cities and in Canada

Nugent Crank Case Fuel Oil Filter



HEAT YOUR BUILDING WITHOUT COST

BY BURNING DISCARDED CRANK CASE OIL

NO MORE BURNER TROUBLE

Write for catalog

WM. W. NUGENT & COMPANY

409 N. Hermitage Ave., Chicago, U. S. A.

Builders since 1897 of

Oiling Systems — Oiling Devices
Oil Filters — Oil Pumps

Full Automatic

Any Capacity

Read this Letter

MONARCH GARAGE
1122-1130 HOLLYWOOD AVENUE AT THE L
CHICAGO, ILL.

Wm. W. Nugent & Co. December 19,1927.
Chicago,Ill.

Gentlemen:-

About a year and a half ago we purchased from you a Nugent Oil Filter and motor driven oil pump to filter automobile crank case oil for our oil burner.

This purchase has been one of the best investments we ever made, because the apparatus paid for itself in less than three months. We operate our burner on the filtered crank case oil entirely, consequently we have no fuel bills.

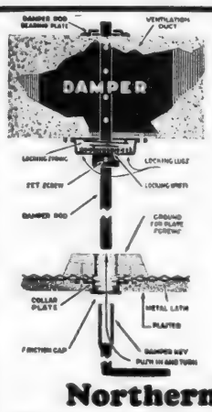
The filter removes the water, dirt, grit, and carbon from the oil so efficiently that the fine mesh strainer at the burner never has to be cleaned, and the burner operates perfectly.

Cleaning the filter requires only ten minutes twice a week and there is no other upkeep to the filter, as the filtering elements will last for years without renewing.

We are very pleased with the filter and pump as well as the service you have given us. We highly recommend your apparatus to anyone.

Very truly yours,

MONARCH GARAGE
By E. C. Falk



ZENITH

SELF-LOCKING Damper Locks

For ventilating systems. Automatically locks volume and splitter dampers in concealed ventilation ducts, in any position.

Concealed—tamper-proof—inexpensive. Write for complete information.

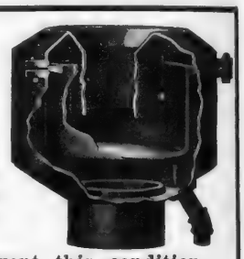
Northern Weatherstrip Co.

365-7-9 South First Ave. E. Duluth, Minn.

DICKINSON

ALL-CAST-IRON

EXHAUST HEAD



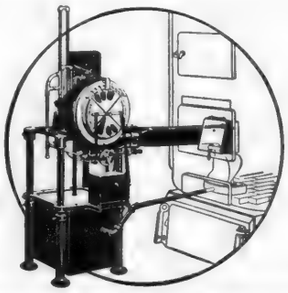
Oil and water content of the exhaust steam escaping and falling upon the roof brings about a condition of decay and disintegration.

Dickinson Exhaust Heads prevent this condition, and being made of cast iron, will last as long as the building. This overcomes necessity of constant replacements.

ÆOLUS DICKINSON

3336-44 So. Artesian Ave. CHICAGO

(Some territory open for agents)



Continuous Flame Dependable Heat

No Gas Pilot • • No Electric Ignition
Graduated Automatic Control
Mechanical Draft

McILVAINE OIL BURNER
Listed by Underwriters

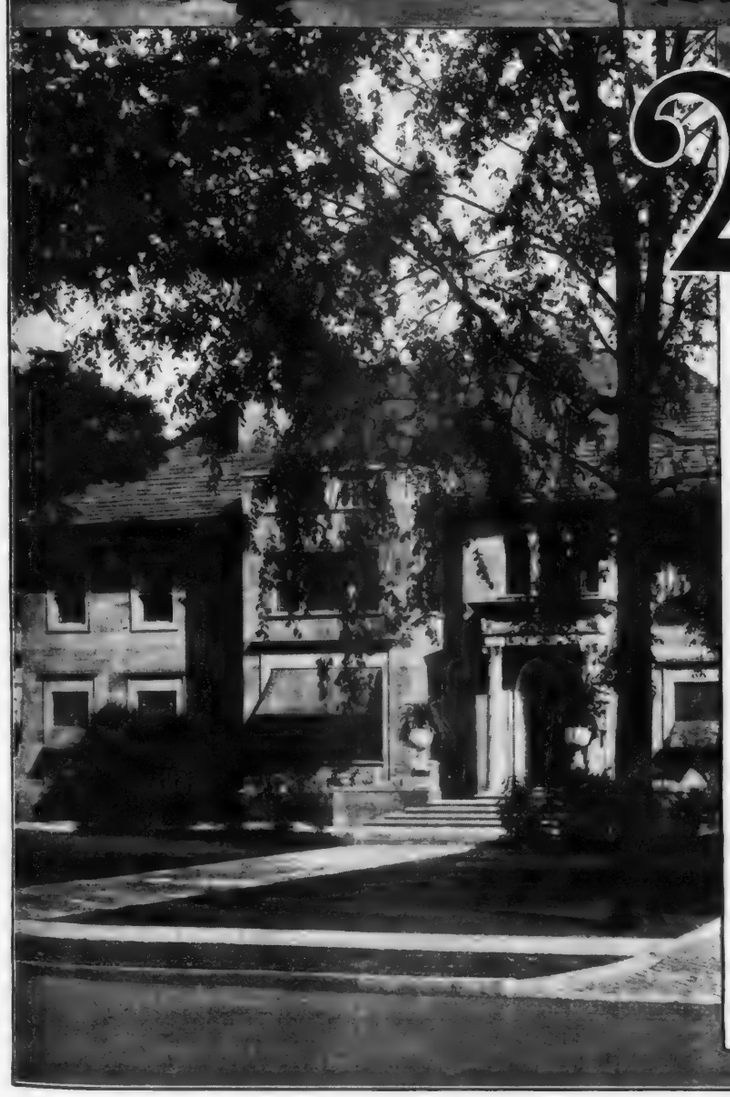
Distributors—Write for the 1928-29 Sales Plan

McILVAINE BURNER CORPORATION

Dept. H • 745 Custer Ave. • Evanston, Ill.

Install half-inch insulation to form 2 air spaces in the walls

¶ *A scientific principle which FLAX-LI-NUM has been designed to accomplish — resulting in increased insulating efficiency according to U. S. Bureau of Standards Tests.*



2 air spaces with Flax-li-num

FLAX-LI-NUM installed by the "2-air-space" method is the economical way to achieve the greatest insulating efficiency. According to the U. S. Bureau of Standards, ½ inch insulation installed midway between the inner and outer walls is equal to about ¾ inch insulation used as a plaster base or in contact with the sheathing.

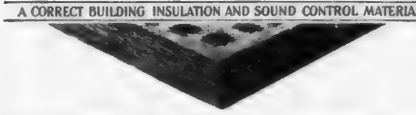
By this remarkable principle FLAX-LI-NUM increases its own basic value fully one-half. It comes in one-half inch sheets, cut and shaped to fit in the walls between the studs—giving maximum results with the least amount of material and labor. For roofs FLAX-LI-NUM is made in 1 inch thickness—all ready to install.

Send for complete FLAX-LI-NUM specifications and the U. S. Bureau of Standards Tests. Let us explain fully why FLAX-LI-NUM has material properties which make it ideal for home insulation—and how by the use of "2 air spaces" these properties are made even more effective.

FLAX-LI-NUM INSULATING COMPANY
St. Paul, Minn.

Flax-li-num

A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL



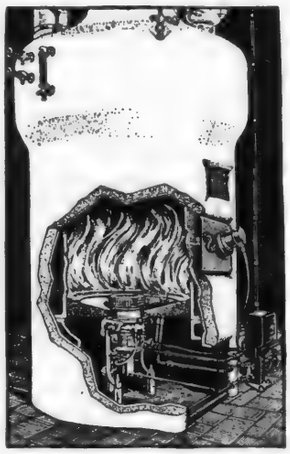
"Smooth as Silk"—
That Describes Toridheet Installations!

TORIDHEET Oil Burner Installations always run with the smoothness and reliability of a modern railroad schedule.

It's all due to simplicity of design plus skillful accuracy in manufacture.

This spells D-E-P-E-N-D-A-B-I-L-I-T-Y. And Dependability under any circumstance is what spells satisfaction for both user and dealer.

Toridheet Dealers never have their profits upset by a lot of time-wasting service calls. This is one reason why each Toridheet Franchise is zealously guarded by the dealer.



Toridheet Installations are noiseless, too. No annoying hum, hiss or whine.

Toridheet is fully automatic. Has dependable operation and clean combustion.

Our Franchise Plan for Dealers is attractive. Exclusive territory is being snapped up. Write Today.

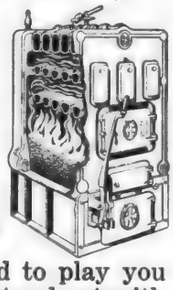
TORIDHEET
OIL BURNER
FOR BETTER HOME HEATING

TO DEALERS:
Equipment is easily installed. Free from profit-stealing, time-wasting service calls. Listed as standard by the Underwriters' Laboratories. Approved by New York Board of Standards and Appeals and by Massachusetts Board of Public Safety.

CLEVELAND STEEL PRODUCTS CORPORATION
Madison at West 74th Street . . *Cleveland, Ohio*

Winning Cards In Every Pack

Burnham Boilers
for Every Heating Purpose

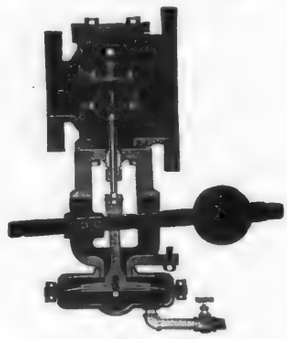


Your Queen of Diamonds is
BURNHAM
Tube Type—27 Inch

BECAUSE—With this card to play you won't be bluffing when you stand pat with a juicy stake on the table. Its roomy inside heat absorbing surfaces will back up all you say of what it will do, if you take its ratings at their honest face value. With this Queen you're all set for a winning show-down. *Ask for Catalog.*

Burnham Boiler Corporation
IRVINGTON, NEW YORK
Representatives in all principal cities of United States and Canada

KIELEY



The Kieley Special '98'

is a phrase found in the Largest Percentage of Specifications where Regulating Valves are Required.

Designed to Fit Efficiently into Any Type of Heating System.

Kieley & Mueller, Inc.
34 West 13th Street, New York City

You Will Find This Portfolio Helpful

The INSULITE engineering staff, which prepared the portfolio here offered, will be glad to confer with you on any heating problem. The portfolio contains helpful charts and much valuable data.

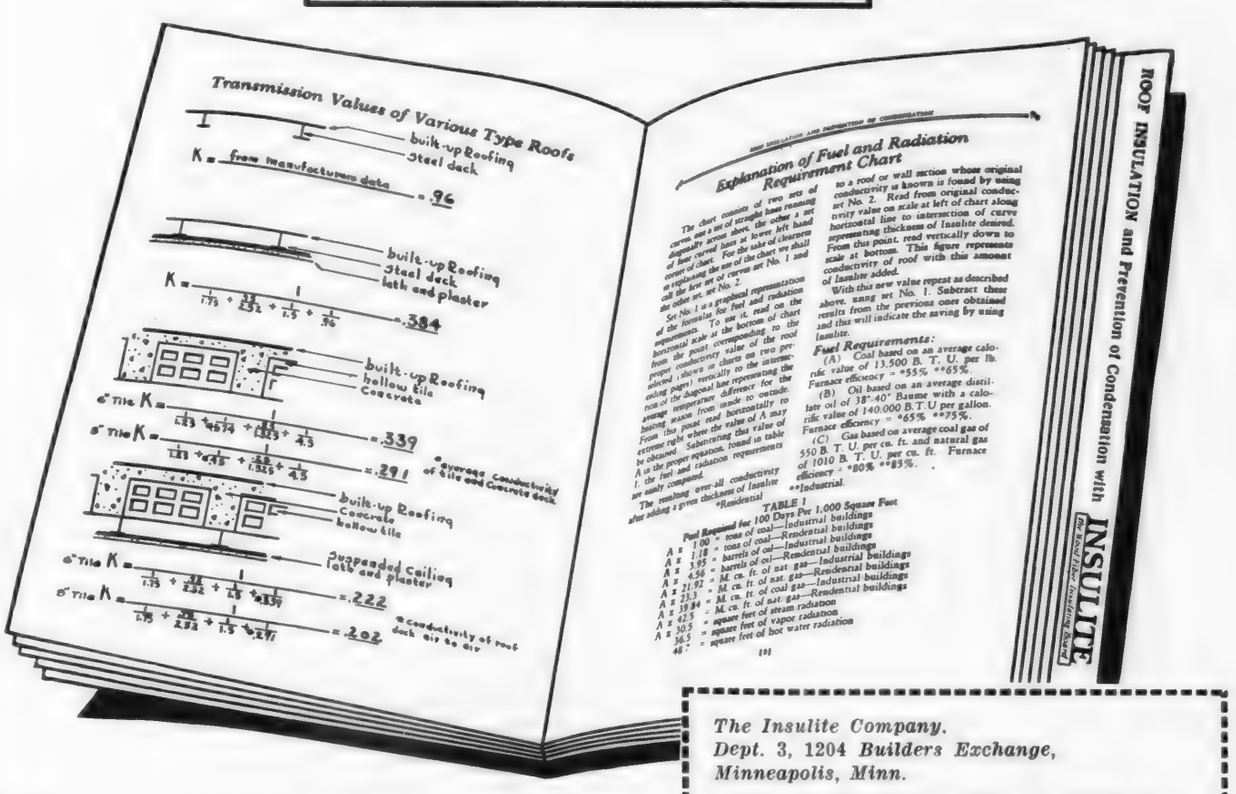
Proper insulation and the prevention of moisture condensation are just as important as radiation itself in figuring heating jobs.

INSULITE offers the sure, satisfactory solution. For roof insulation it is made in one inch and one-half inch thicknesses. It has great strength, great heat resisting value, is easy to handle and work with. Waste through breakage is eliminated. Moisture and exposure do not injure it.

Write to-day for your copy of the portfolio.

INSULITE

the Wood-Fiber Insulating Board



THE INSULITE COMPANY

Dept. 3, 1204 Builders Exchange

MINNEAPOLIS MINNESOTA

The Insulite Company,
Dept. 3, 1204 Builders Exchange,
Minneapolis, Minn.

Please send your Insulation portfolio to

Name .....

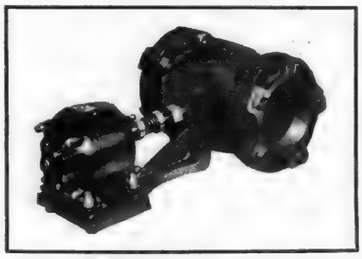
Address .....

City..... *State*.....

"PEP-UP"

YOUR HOT-WATER JOBS WITH A

Sterlco TRADE MARK *Compeller*



Patent Applied For

The Compeller is a miniature motor driven pump that is installed in either the supply or return line of a hot water heating system. It will positively circulate the water regardless of temperature or pressure and will provide uniform heat in all radiators in half the time ordinarily required. No by-pass or check valve is required and the operation of the motor can be automatically controlled so as to run only when heat is required.

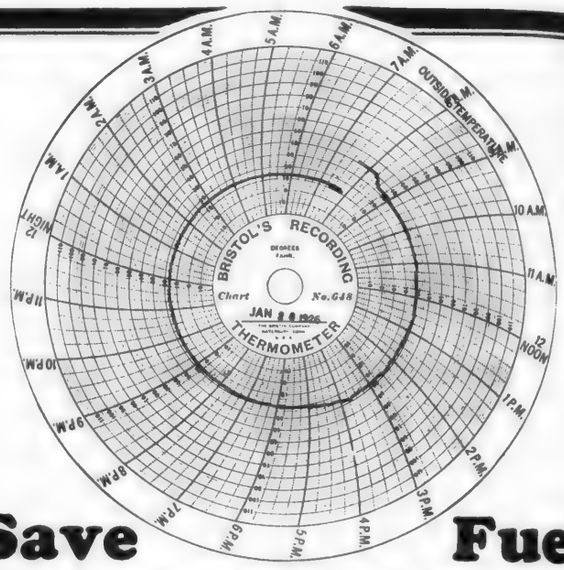
Send for descriptive circular

STERLING ENGINEERING CO.

1626-44 Holton Street

Milwaukee, Wis.

Sales Representatives in all the principal cities



Save Fuel

By Keeping a Check on Out-Door Temperatures

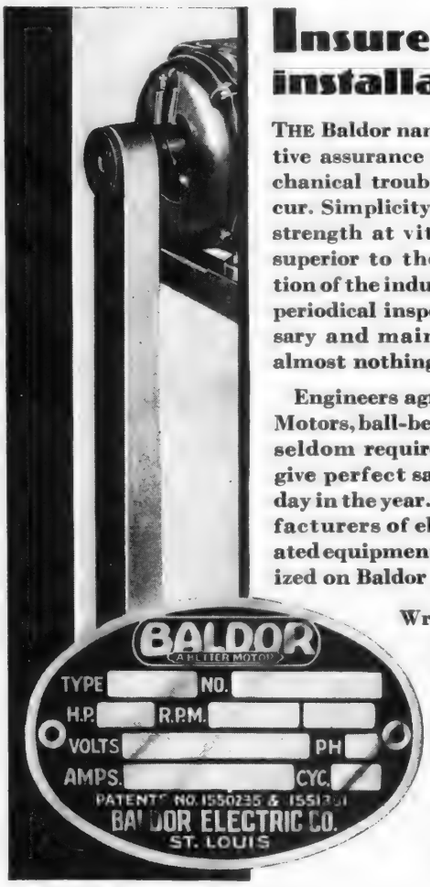
Greater economy in boiler room operation is possible when the engineer can direct firing operations under the guidance of continuous chart records of out-door temperature.

Note how clearly the record line on the above chart shows the gradual drop in temperature. Starting at about 40° at 7.40 o'clock in the morning a drop of 30° is recorded up to the same time the next morning. As a result of having such a chart for reference, demands on the heating system can be anticipated and more uniform firing assured.

Bristol's Recording Thermometers are of sturdy construction; simple and direct in operation, and will give years of dependable service without trouble. Write for complete information.

The Bristol Company

Waterbury - - Connecticut



Insure your installations

THE Baldor name plate is positive assurance that petty mechanical troubles will not occur. Simplicity in design, extra strength at vital points even superior to the recommendation of the industry, make rigid periodical inspection unnecessary and maintenance costs almost nothing.

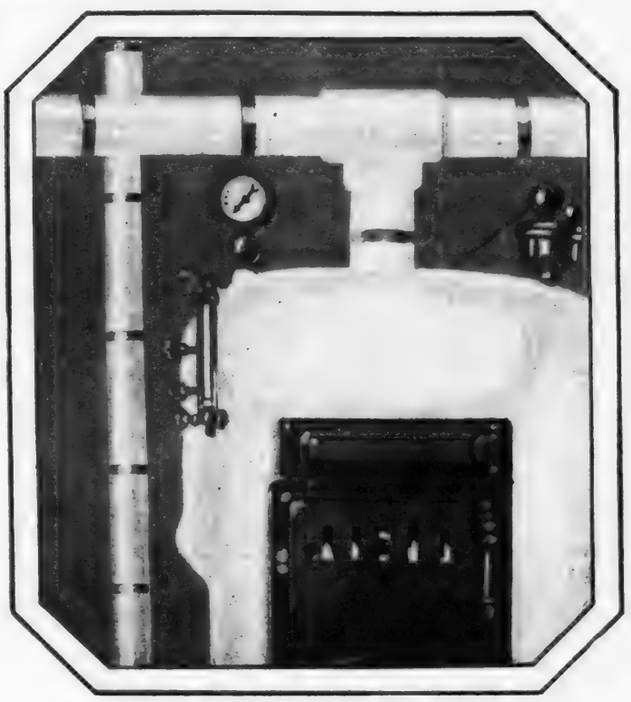
Engineers agree that Baldor Motors, ball-bearing equipped. seldom require attention and give perfect satisfaction every day in the year. Leading manufacturers of electrically operated equipment have standardized on Baldor Motors.

Write for Bulletin today. It contains valuable motor data you should have.

BALDOR Electric Co.

4356 Duncan Ave. St. Louis, Mo.

Builders Demand insulation that helps sell the house



Improved Asbestocel makes a clean-cut looking job —goes on quicker, too

NOT every person who goes out to buy a house knows much about pipe insulations—but the prospective home buyer does recognize quality, and he also knows famous names such as Johns-Manville.

When you estimate on heating jobs for speculative builders plan to use Improved Asbestocel. The extensive advertising of Johns-Manville is keeping builders constantly sold on Johns-Manville products. If a builder should object to the slightly higher cost of Improved Asbestocel over ordinary air cell, you should point out that the use of Improved Asbestocel is to his advantage fully as much as it is to yours.

All the pipes you cover with Improved Asbestocel will present a neat, even, well-finished appearance impossible to get with ordinary air cell. Such little touches help sell houses.

But chief of all advantages to the speculative builder is the stamp of quality which the name Johns-Manville puts on any building job. Improved Asbestocel is heavily advertised to the public. It is a known product.

The builder who buys Johns-Manville Improved Asbestocel from you is paying very little for a lot of help in moving his houses.

MASTER *of* ASBESTOS

Johns-Manville

IMPROVED ASBESTOCEL

JOHNS-MANVILLE CORPORATION
New York, Chicago, Cleveland, San Francisco
Branches in all large cities
Canadian Johns-Manville Co., Ltd., Toronto
(Mail this coupon to branch nearest you)

We are interested in your selling plan for Improved Asbestocel.

Name.....

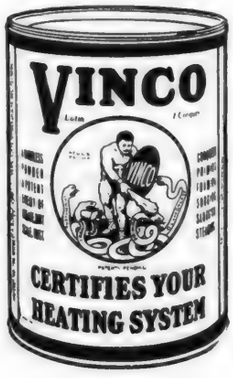
Address.....

City.....State.....

"VINCO" All Heating Systems Now!

RID THEM OF OIL, GREASE, RUST, SCALE, DIRT

"Insure maximum heating service for which the system was designed"



There is no substitute for Vinco

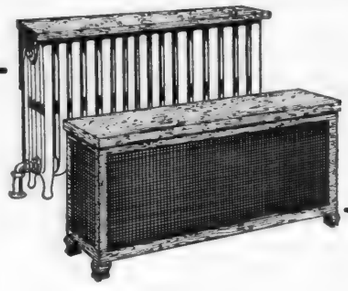
This scientific, guaranteed corrective, so easy to apply, is specified by leading boiler and heating appliance manufacturers for the equipment they make, as well as by foremost heating engineers.

PROMPT ACCEPTANCE ON NEW JOBS
NEW PROFITS ON OLD JOBS

SEND FOR BOOKLET GIVING DIAGNOSIS AND TREATMENT OF DIRTY HEATING SYSTEMS—Make sure that you will have no call-backs or come-backs on heating systems that don't stand the test of real winter.

VINCO IS STOCKED BY REPRESENTATIVE JOBBERS THROUGHOUT THE UNITED STATES.

VINCO COMPANY, INC. P. O. Box 126 City Hall Sta. N. Y. C.



We Want Dealers

Heating Contractors

Do Big Business by Installing our **Baked Enamel Shields** and **Art De Luxe Cabinets,** as every radiator installation means a ready and almost **Certain Prospect** for the **Sale** of our **Shields** or **Cabinets.**

Architects

Continually specify and recommend our **Splendid Line** because **Circulation is Not Retarded** on **Account** of our **Construction** which permits of **Ready Circulation** of **Both Cold** and **Hot Air.**

Write for Prices and Dealer Agreement.

ACME RADIATOR SHIELD CO., Inc.
Manufacturers of "Modern" Radiator Furniture
48 and 50 Vine Street **Cincinnati, Ohio**

"Sheer Comfort" Control

Sells at $27.00 Complete

"Sheer Comfort"

AN Electric Thermostat Heat Control that makes any furnace automatic. Everybody wants it—and you will want to sell it the minute you see it work. The "Sheer Comfort" Control means efficient house heating, savings in fuel, protection of health, and "Sheer Comfort." Positive, accurate, lifelasting. Priced so you can sell it. Write today on your letterhead for descriptive circular, dealer's prices, terms, etc., or enclose $17.55 for complete sample outfit.

Address Dept. HV.

H.M.Sheer Co. Quincy, Ill.
ESTABLISHED - 1886

Put Your Insulating Problems Up to a Banroc Engineer — He Will Show You How to Solve Them

His job is stopping heat losses, and he knows how to tackle the problem, get right down to the seat of the trouble, and make you recommendations that will mean permanent, economical efficiency. His knowledge and experience, as well as the knowledge and experience of the entire engineering staff of the originators of rock wool products, are at your disposal. Call him in — you'll find him listed under the name of the Banner Rock Products Company in the phone directories in the following cities:

Boston	Buffalo	Denver	Pittsburgh	Toledo	Los Angeles	St. Louis	Houston
New York	Newark	Philadelphia	Cleveland	Detroit	Chicago	San Francisco	Tulsa

BANNER ROCK PRODUCTS COMPANY, ALEXANDRIA, INDIANA

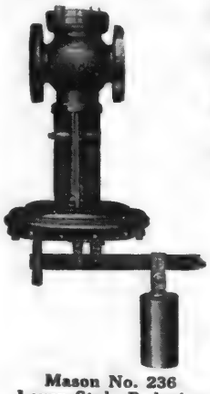
BANROC INSULATION

"Originators of Rock Wool Products"

We set 'em and forget 'em

Easy to install . . . steady, dependable service, without trouble, without requiring a lot of attention . . . set 'em and forget' em . . . these are the reasons why a steadily increasing number of heating and ventilating engineers are specifying Mason Regulators on all of their contracts.

Tests more severe than any imposed in actual service are given each regulator before it leaves the factory . . . sensitivity and accuracy do not diminish with long, continuous use.



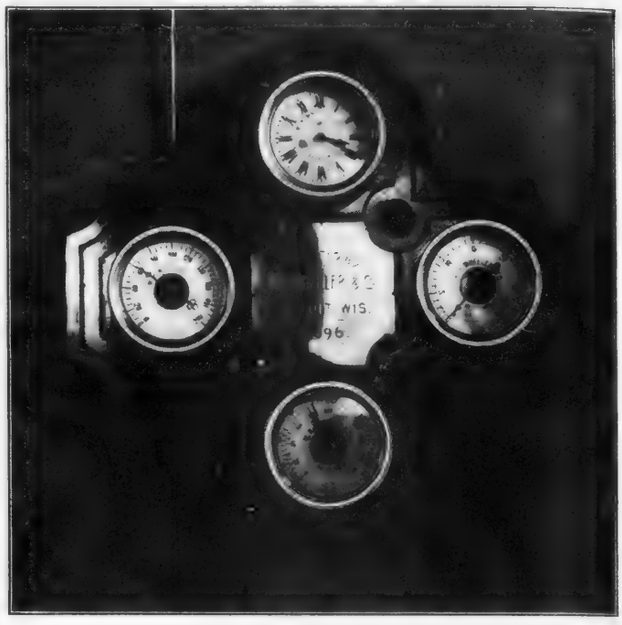
Mason No. 236 Lever Style Reducing Valve

Write for a copy of newly revised Catalog No. 62 which gives a complete description and prices of all Mason Regulators.

Mason Regulators

MASON REGULATOR CO.
BOSTON, MASS. 2348

GAUGE BOARDS



HERE is a gauge board of the Gay Nineties. These American Gauges were installed 32 years ago in the Water Works at Watertown, Wisconsin. They have never been repaired and have always remained accurate.

Judged by present standards, it's a funny looking board, isn't it? A product of the plush picture frame age. But the gauges were made to last through many ages.

American Gauges are like that. American Gauge Boards installed now will still be accurate in 1958.

Write for the following Catalogs:

Gauge Catalog A-14,
Recording Gauge Catalog E-14,
Gauge Tester Catalog D-14,
Relief and Pop Valve Catalog V-14,
Thermometer Catalog F-14,
Dial Thermometer Catalog G-14,
Recording Thermometer Catalog H-14,
Temperature Controller Catalog R-14.

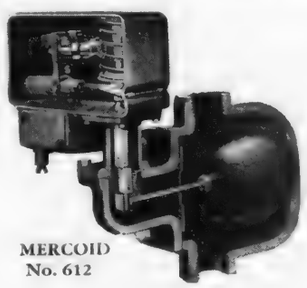
AMERICAN INSTRUMENTS

SINCE 1851

CONSOLIDATED ASHCROFT HANCOCK CO. INC.
AMERICAN SCHAEFFER & BUDENBERG DIVISION
338 Berry Street Brooklyn, N.Y.

PREVENT
TROUBLESOME SERVICING
with this complete line of
MERCOID Controls *for* OIL BURNING

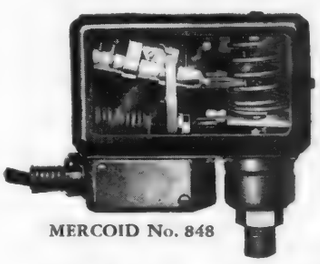
IT WILL pay you to investigate *at once* this remarkable line of Automatic Controls for Oil Burning. You too will find, as have thousands of other Oil Burner engineers, that Mercoid Controls put an end to all troublesome and costly service calls. These simple rugged instruments are accurate and can be set for extremely close control. And of greatest importance is the fact that there is no chance for corrosion of contacts nor any need for intermediate controls. Mercoids operate on full line current either 110 or 220 volts—A.C. or D.C. any cycle. Let Mercoid Controls stand back of you on all your Oil Burner installations.



MERCOID No. 612

MERCOID CONTROL No. 612
Combination Low Water Cutout and Pressure Control

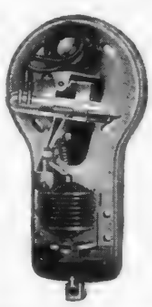
Since oil burners are automatic, owners frequently fail to watch the water level on steam boilers. Firing a dry boiler often causes serious damage. No. 612 will prevent this, for it shuts off the burner when the water reaches a low level and prevents the burner from starting again until the boiler is filled. No. 612 is a safety device that every steam or vapor oil burner job should have. In addition to the low water cutout feature this instrument has an accurate and positive steam pressure control, with a range from ¾ pounds to 8 pounds and higher if desired. Differential adjustable for control as close as ¾ pounds to as wide as 5 pounds. Two instruments in one makes the price of the No. 612 very low.



MERCOID No. 848

MERCOID CONTROL No. 848

One of the many models in a complete line for the accurare control of temperature, pressure or vacuum. Can be used to accurately control temperature from 30° F to 600° F and pressure from vacuum to 2500 pounds. For vapor and "below atmosphere" jobs, control as close as one ounce if desired.



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MERCOID THERMOSTAT No. 845

For the accurate control of room temperature. Successfully used in connection with oil burners, buckwheat coal burning devices, Unit Heaters, etc.

Send today for Free Literature, describing in detail the complete line of Mercoid Controls. Use handy coupon at the right

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No more fuel-wasting

The surest way to check waste in a heating plant is to keep accurate instrument records. If you want to run a heating system efficiently, you have to check every detail.

A neat, compact panel of Foxboro Instruments will enable you to see at a glance the whole story from boiler to radiators and back again.

Foxboro Indicating and Recording Gauges for any pressure and vacuum will accurately indicate or record Boiler pressure, Water pressure, Vacuum or Returns.

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Foxboro Guarantee sealed to each Controlling and Recording Instrument.

If you want dependable instrument equipment, specify Foxboro. Write to the nearest Foxboro Branch for information.

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Instruments for Controlling, Recording and Indicating Temperature, Flow, Humidity and Pressure.

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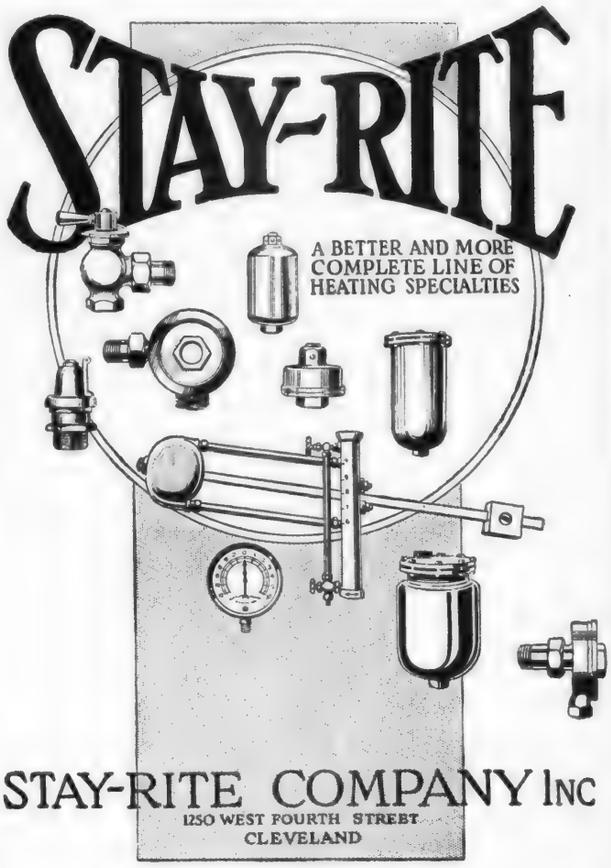

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MOTORS
and FANS

Serving the Field of Automatic Heat

Room Temperature Controls

No. 135 Thermoswitch
No. 136 Clock Thermoswitch
No. 64 Thermoswitch
No. 26AR Convoswitch

Pressure Controls

No. 33 Pressureswitch
No. 42 Vaporswitch
No. 71 Pressureswitch
No. 131 Duplexswitch
No. 132 Vaporswitch

Sequence and Safety Controls

No. 77 Lockswitch
No. 123 Burner Boss
No. 48MR Stackswitch
No. 106 Furnaceswitch

Water Temperature Controls

No. 30 Hydroswitch
No. 56 Aquaswitch

COMFORT and convenience, the two principal selling points for oil or gas burners, depend entirely upon the efficiency and dependability of the control system and its instruments. In developing and manufacturing control instruments and systems which, because of their **simplicity,** assure dependable comfort and convenience, Con-Tac-Tor has served the entire field of automatic heat, and has contributed toward the success which fluid fuel has achieved.

Mercury switches are used as the contacting means in all Con-Tac-Tor controls. These switches afford the most satisfactory method for opening and closing circuits, because they are sealed against dirt, cannot corrode or burn, even at maximum load, and can be actuated by the **simplest of mechanisms.**

Highly sensitive room temperature controls, dependable safety pressure cut-outs, boiler controls which may be installed without drilling or tapping —these are a few of the outstanding Con-Tac-Tor developments. The instruments and system for your control problem will be found in Bulletin 111.

Con-Tac-Tor will exhibit at the Power Show, New York City, December 3-8. Experienced men from the factory will be in charge.

ABSOLUTE CON-TAC-TOR CORPORATION

ELKHART INDIANA

W. J. Gilmore Building, Pittsburgh

Could you properly heat a building like this with steam shut off two-thirds of the time?

That's what Hornung Master Control Valves made possible in the heating of the W. J. Gilmore Drug Company Building, Pittsburgh. *Note carefully chart and table below.*

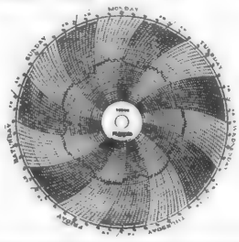
If no customer can use more steam than is really needed, you will save in the boiler room in mild weather, and in cold weather will have enough steam to serve more customers than you can now take on. And complaints from your customers about big bills will stop.

Steam Consumption

	Estimated	Actual
October, 1927	556,000	215,000
November	1,205,000	1,035,000
December	1,668,000	1,204,000
January, 1928	1,853,000	1,496,000
February	1,462,000	1,141,000
March	1,297,000	1,104,000
	8,041,000	6,195,000

SAVING — 1,846,000
With Hornung Master Control Valve

Temperature Chart No. 79903 covers Master Control performance for week ending February 8, 1928. It was taken from Hornung 8" Master Control Valve, controlling both pressures and temperatures in one valve. Clock type thermostat used.



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J. C. Hornung, *Engineer*

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The wide range in fuel which **PYRAMID GRATES** burn makes them highly economical.

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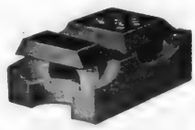

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In Homes, Apartments, Office Buildings, Garages, Churches, Schools, Public Buildings, etc.
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INTERNATIONAL FUEL SERVICE CORP. **BRIDGEPORT, CONN.**

3 features

Make Time-O-Stat the Wonder Regulator of Today

COMBINED in the beautiful Time-O-Stat Temperature Regulator are scores of advanced features. Each one is important. Each one is a vital element which enables Time-O-Stat to do its job of temperature regulation **more reliably, accurately and efficiently. Yet, there are three features of outstanding importance.**

FIRST: Time-O-Stat provides a genuine Seth Thomas 8-day clock of greatest accuracy and dependability. It is so important because it is the very brains of the whole mechanism. A clock mechanism is indispensable for 100% temperature control.

SECOND: Time-O-Stat offers a General Electric power unit in the Electric Control Motor. The General Electric was the unanimous choice of Time-O-Stat engineers. By employing this 20 volt motor all conduit is eliminated, reducing the cost and making a neater installation.

THIRD: Time-O-Stat's own invention—the snap action contact blade. This improvement over other room temperature regulators provides maximum temperature control accuracy with a minimum of adjustments. Operation is mechanically simple — so easy any householder can reset.

In addition, Time-O-Stat is distinctive and beautiful both in line and finish, made to harmonize with the most fastidious surroundings. It is furnished in rich silver plate or statuary bronze.

As a health guardian the Time-O-Stat Regulator is a modern necessity. It is the only solution to the problem of overheating which makes so many homes unhealthful.

Exclusive sales-service dealers are now being established in all cities. Literature descriptive of the Time-O-Stat Temperature Regulator will gladly be sent on request.

Time-O-Stat

Adaptable for Coal, Gas and Oil.

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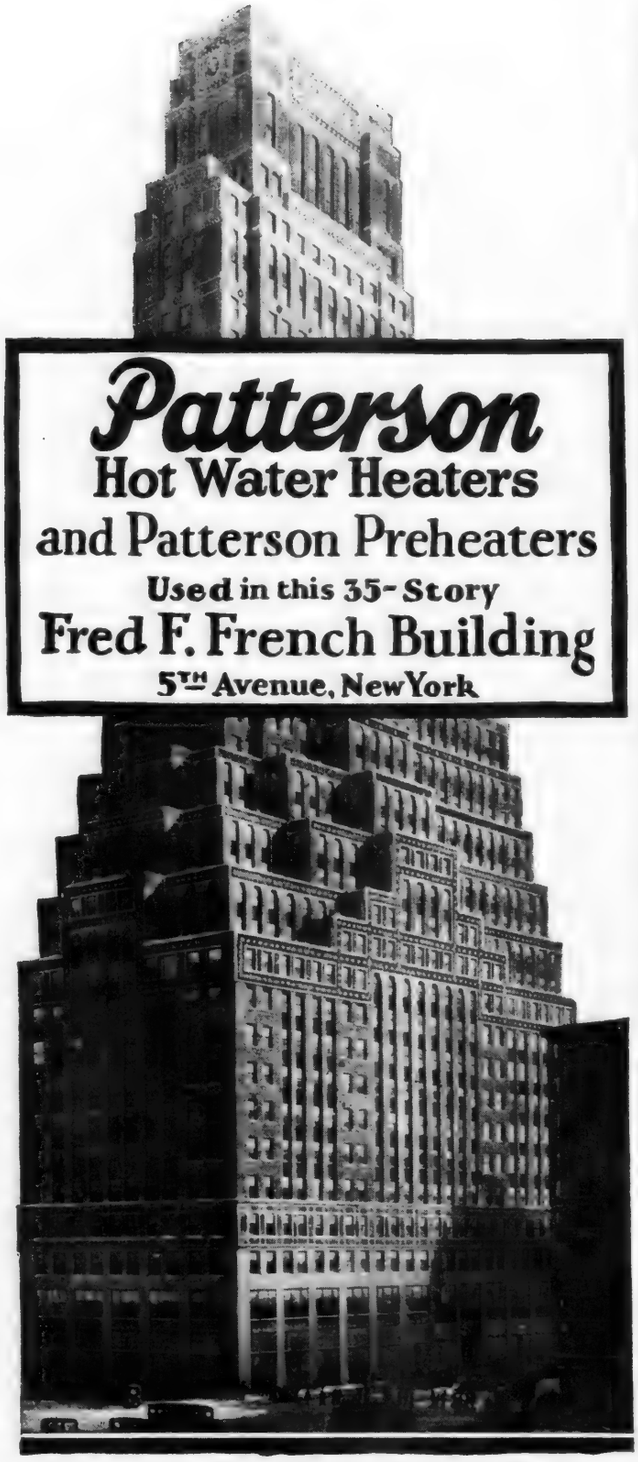

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Used in this 35-Story
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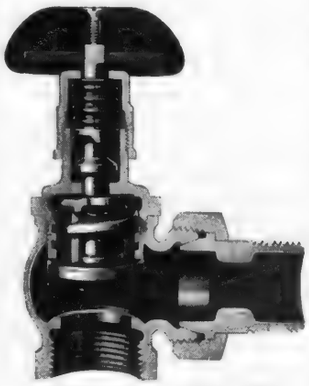
STA-PAK VALVES
Never Require Repacking



Send for catalog of complete line of Capitol valves.

ONCE installed, the STA-PAK requires no further attention. No repacking is ever necessary.

It has a very high lift; one turn of the mushroom handle opens or closes it.

Union nut is made of forged brass which provides double the tensile strength of the ordinary cast brass nut.

Manufactured of tested materials. STA-PAK Valves are quality products that will appeal to both the heating engineer and his customer. STA-PAK Valves are offered at attractive prices.

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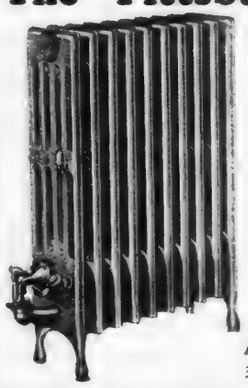
The "Pittsburgh" Automatic
Gas Steam Radiator



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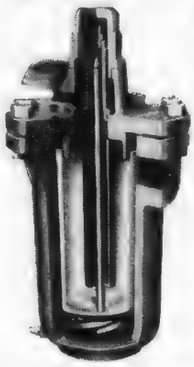

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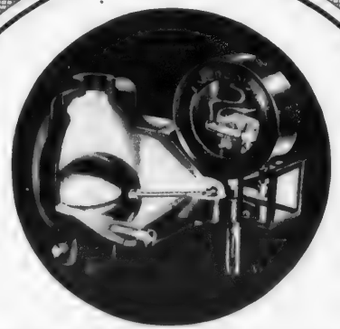

Fig. 71

MERCOID COMBINATION CONTROLS

FOR LOW WATER AND PRESSURE
Types Available for Pressures Up to 300 lbs.

This type of equipment is designed primarily for the protection of automatically fired steam boilers, by means of the low water level, and guards against firing into a dry boiler. Equipment to which fuel is supplied continuously offers the hazard of firing into dry boilers or building up excess pressure, against which this instrument is also designed to guard.

This control may be furnished for completely automatic, or semi-automatic operation for those types of burners which require it, and types may be had for unusual as well as ordinary requirements.

No relay or starting switch is necessary where the normal working loads do not exceed 10 amperes at 110 volts or 5 amperes at 220 volts. either A.C. or D.C.

MERCOID
System of
DIRECT CONTROL

UNIT HEATERS

Unit Heaters give the maximum of satisfaction and efficiency when controlled by Mercoid Thermostat Figure 21. For dual control Risertherm Fig. 35 in combination.

Investigate the Outstanding Features of Mercoid Controls for Your Special Requirements

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25 CHURCH STREET *New York, N. Y.* — THE MONADNOCK *San Francisco, Calif.*

Cable Address "Mercoid, Chicago"

Fig. 36

MERCOID IMMERSION TYPE CONTROL

For Hot Water Boilers

All the essential factors that go to make up a perfect automatic limiting device are found in the Mercoid Immersion Type Controls for Hot Water Boilers.

This instrument has proven its unfailing accuracy and durability over many years of service.

Back angle stem types furnished where the service requires this style of mounting.

For direct control where the normal working loads do not exceed 10 amperes at 110 volts or 5 amperes at 220 volts, either A.C. or D.C.

Suitable ranges available for vapor or special requirements.

All Mercoid Hot Water Boiler Controls have a simple adjustment for raising and lowering the cut-in and cut-out points.

MERCOID CONTROLS

WHAT IS THIS RAYMOND DUO-STAT

and why will it give you even heat from your oil burners or gas burners instead of the fluctuating heat you now have?

Write now and find out.

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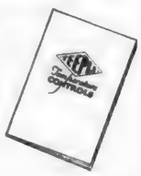
You sell satisfaction when you sell

Teeple Controls

ELECTRIC GAS VALVE

Customers expect accuracy and reliability in temperature controls. They are sure of these qualities when you sell them Teeple instruments. They meet every problem of heat control for gas furnaces and boilers; unit heaters; refrigerating plants; ovens; furnaces; and automatic coal and oil burners. You can recommend them.

Write for this new Catalog . . . . . .



Our latest Catalog fully illustrates and describes the full line of Teeple Controls. Gladly sent.

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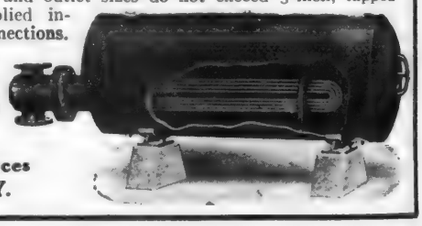
TEMPERATURE
Controls

for GAS — STEAM — WATER — AIR

Various Applications

O. E. F. Storage Heaters are used in clubs, schools, hospitals, laundries, office buildings, apartment houses, and industrial plants, wherever large quantities of water are required.

The water to be heated is contained in the tank which provides a storage capacity, and the steam is passed through the tubes. It enters a large steam-distributing chamber, so designed that the tube-bundle may be removed without breaking any length of pipe. Where steam inlet and outlet sizes do not exceed 3-inch, tapped openings are supplied instead of flanged connections.



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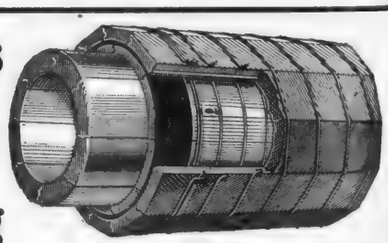
Wyckoff's Improved Cypress Covering



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As well as being highly efficient in its application, Wyckoff Improved Cypress Steam Pipe Covering withstands all conditions attending steam pipe trenches. All engineers who know Wyckoff Pipe covering specify it because it lasts.

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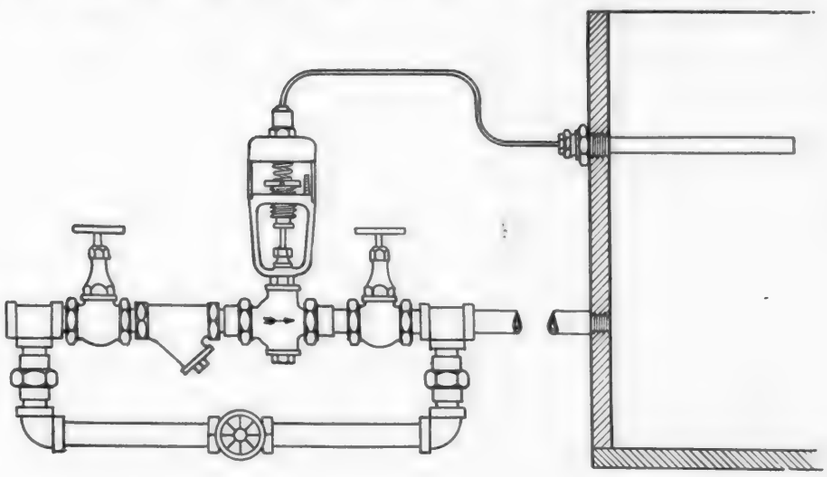
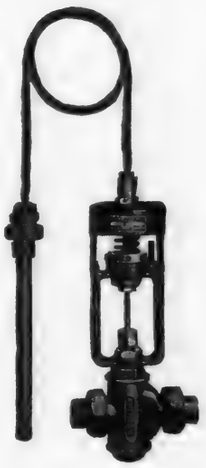
Temperature Control



For Water Heaters and Storage Tanks

Precision regulation pays. If the temperature is to be controlled at all, then the closer the better. The American Precision Temperature Controller maintains a uniform temperature all the time. There is never any variation. It will regulate to within 1° F. plus or minus. Compare its accuracy.



The heart of a temperature controller is the bellows. The bellows in the American Precision Controller will expand and contract 60 million times before rupturing. That's what gives it long life. Compare its durability.

Test one yourself—without obligation. You will not be expected to keep it unless you're completely satisfied.

Send for Folder R-14

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WHITLOCK
HEAT TRANSFER
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1190 Gallons of Hot Water per Hour!

Heated from 50° to 180°

That's what the Whitlock 54" x 120" Type K Heater Supplies in the monumental new Los Angeles City Hall. Whitlock Heaters are more and more being selected for the finest buildings in the country. Consultation with one of our Hot Water Engineers regarding any building you may be planning will prove helpful.

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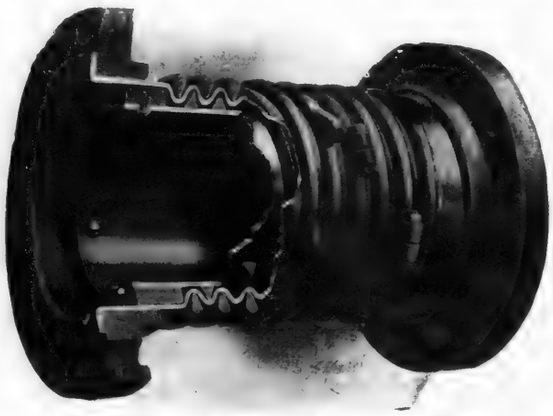
The expansion in pipe lines carrying steam, hot water or oil is ideally taken up by the Wainwright expansion joint.

Wainwright expansion joints have no packing. The movement is taken up by a seamless corrugated copper tube. Inside and outside rings distribute the movement to be absorbed between the several corrugations of copper and each corrugation takes up a portion of the total expansion of the line. An inside protecting sleeve on the Wainwright joint protects the copper expanding members from high velocity steam and reduces the friction loss, or resistance to flow, through the joint.



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Wainwright joints in sizes 3 to 14 in., are built for 150 lb. working pressure; sizes 16 to 24 in., for 125 lb. working pressure.

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On many a newly-installed oil burner, service calls sometimes reveal nothing but an empty fuel tank! This may not be your fault, but why run the risk of your customer's dissatisfaction? There's only one way for both customer and contractor to be certain—specify the K-S Telegage.

At all times, with ease and accuracy, the Telegage tells at a glance the actual depth of liquids in storage tanks. Placed at any distance from the tank, and either above or below it as you may prefer, this precision instrument guards fuel oil and all other kinds of liquid storage against checking errors and costly failures. It shows when a new supply is needed, and exactly how much.

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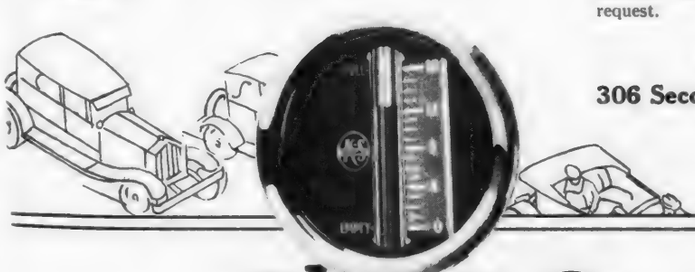

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BE CERTAIN WITH THE *K—S TELEGAGE*

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Maintain the Water Line in all Types of Steam Heating Systems

BY returning all condensation to the boiler THERMO SYPHON TRAPS assure the maintenance of the boiler water line. Prevents burning or cracking of boiler due to water leaving the boiler or becoming locked in the system. Prevents air-bound or water-logged conditions. Insures noiseless operation. Safeguards all types of vapor or atmospheric systems.

Especially designed to handle the condensation from any type of one pipe or two pipe steam heating systems, with a vacuum or pressure not exceeding 20 pounds boiler pressure.

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To fully emphasize the tremendous number of advantages of this type of water heating, we have prepared a concise but complete bulletin on the indirect method for heating water for large buildings.

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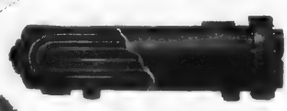

Paracoil U-Tube Instantaneous Water Heater

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Paracoil Water Heating equipment for both large installations and small are rigidly guaranteed both as to construction and service. Their dependable performance and years of usefulness have led to their being specified on many of the largest and most important building jobs.

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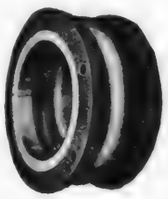
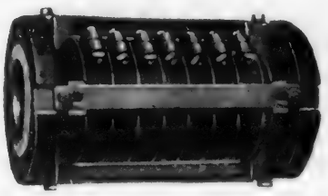
The Development of Badger Expansion Joints



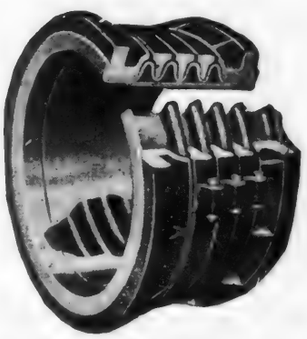
Badger Single Corrugation Expansion Joint for low pressure and for maximum expansion of ⅛ in.

Badger Multiple-Corrugation Expansion Joint for low pressure and for maximum expansion of ⅛ in.



Badger Flange Type Self Equalizing Expansion Joint for 4 and 5 in. pipe for 200 lb. pressure and for maximum expansion up to 2 in., depending on number of corrugations.

Badger Flanged Type Self-Equalizing Expansion Joint, pipe, for 200 lb. pressure and maximum expansion up to 3 in.

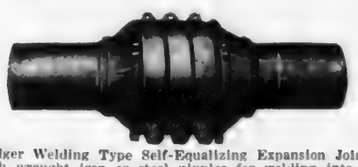


Badger Flange Type Self-Equalizing Expansion Joint, with monel metal telescoping sleeve for superheated steam, up to 200 lb. pressure; and maximum expansion up to 3 in.

Badger Flanged Type Double Expansion Joint with Structural Steel Anchor and Guides.

E. B. Badger & Sons Co. have been identified with the development of copper expansion joints—beginning with the earliest single corrugation low pressure type to the present day reinforced high pressure multi-corrugation type with equalizing rings that distribute the movement evenly among all the corrugations. The more rigid requirements by high temperature superheated steam were met by providing an internal telescoping Monel metal sleeve. More recently the welding type joint with wrought iron or steel nipples for welding directly into the pipe line was developed and has found wide application because it saves the labor of making up flanged joints and practically eliminates pipe line maintenance. Now the further development of the special corrugating process enables us to offer Badger Expansion Joints in all types and sizes with one-piece steel expansion elements for oil lines operating at high pressure.

Consult us on your pipe line expansion problems. Write for bulletin now.



Badger Welding Type Self-Equalizing Expansion Joint with wrought iron or steel nipples for welding into a pipe line, for 200 lb. pressure; sizes to 30 in. pipe and maximum expansion up to 3 in.

Badger Double Self-Equalizing Expansion Unit Welding Type with service outlet, for 200 lb. pressure; and maximum expansion up to 6 in. Also furnished as complete unit with anchorage and structural steel guides and base.

E. B. BADGER & SONS CO.

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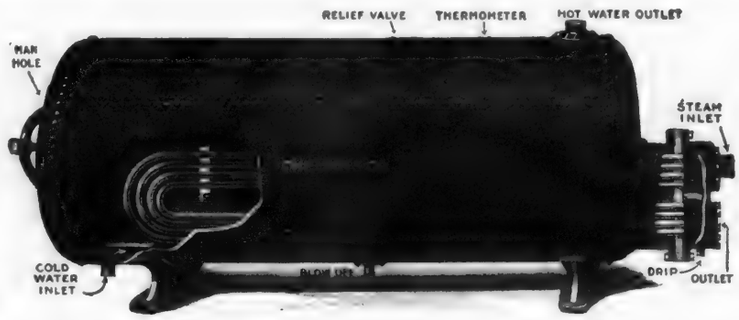
BADGER EXPANSION JOINTS

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · E.B. BADGER & SONS COMPANY · TRADE MARK



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SIMS

Storage type water heaters are furnished with "U" tubes as illustrated, or with straight tubes and floating head, as may be desired or specified.

SIMS

Water tube heaters and Converters are also constructed with either straight or "U" tubes.

All heaters are produced complete in our plant. They are not an assembly of parts built by others.

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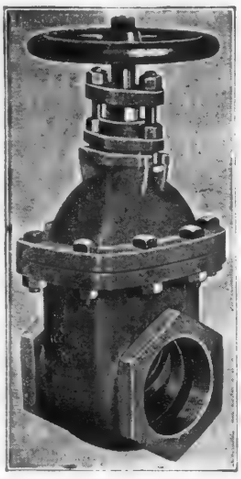

SCREWED, FLANGED
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NON-RISING STEM
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O. S. and Y. PATTERNS

ALSO MANUFACTURERS OF
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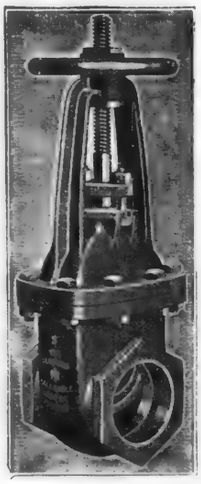
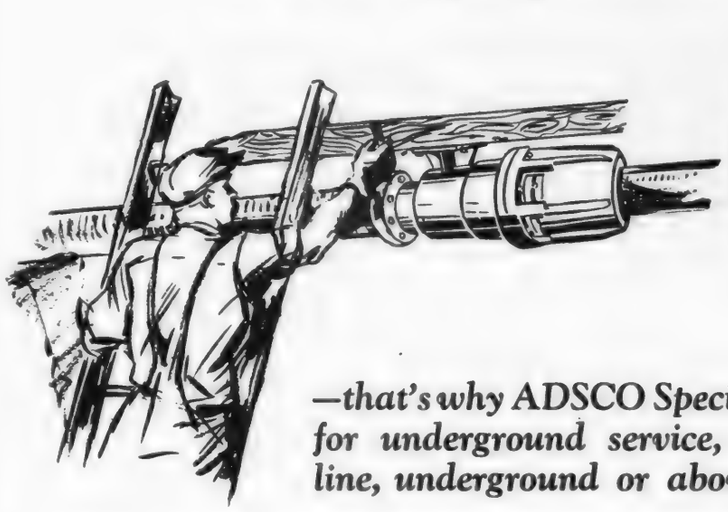
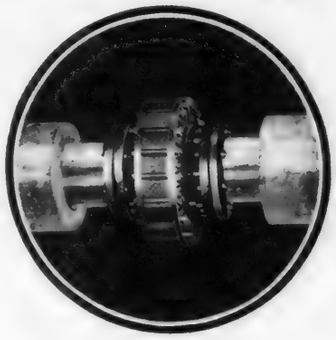


Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

You can't climb a ladder . . . . .
when equipment is underground





—that's why ADSCO Specialties, designed especially for underground service, are best for any steam line, underground or above, high or low pressure.

FIFTY years of constant effort have been devoted to making ADSCO equipment the best that experienced engineering minds could design for *underground* use.

There has been no compromise with efficiency or strength in any ADSCO unit, for ADSCO knows well that when a steam line is buried underground, you can't climb a ladder to make adjustments or replacements. Underground troubles are hard to locate—costly to repair.

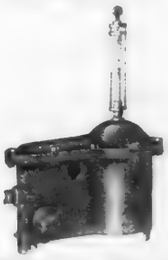
That's why every specialty bearing the ADSCO name is widely preferred both for service above and below the ground, for by giving trouble-free service underground, they are unequalled for any steam line service anywhere.

Heating engineers and contractors are invited to send in their blue prints for any steam distribution lines, underground or overhead, high or low pressure; and without obligation our Engineering Department will gladly recommend the equipment best adapted for each installation—quoting prices.

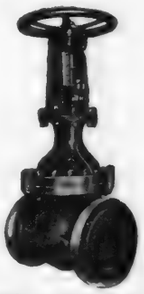
Our blue book on "Expansion in Pipe Lines" will interest you. Send for it!

ADSCO Red Diamond Brand Casing. Insulation and conduit combined. Made from thoroughly kiln-dried selected staves with tongue and groove joints. Strong, waterproof construction. Over 91 per cent efficient.

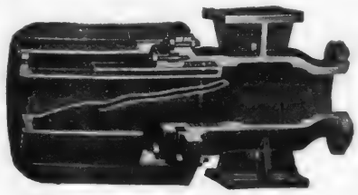
ADSCO Model P Variator for pressures up to 125 pounds. Takes up expansion and contraction. A packless expansion joint never requiring any attention whatever.



ADSCO Empire Steam Trap for low pressure. Operating range, vacuum to 20 pounds pressure. Extremely simple and dependable, insuring continuous, carefree service.



ADSCO Nelson Gate Valve for 400 pounds working steam pressure. Completely mounted with non-corrosive metal. Designed for continuous, dependable service. Other valves for lower pressures.



ADSCO Duplex-Sleeve Guided Expansion Joint for pressures up to 500 lbs., and any temperature up to 750° F. Air-cooled slip eliminates packing trouble, and insures years of trouble-free service.

AMERICAN DISTRICT STEAM COMPANY

NORTH TONAWANDA, N.Y.

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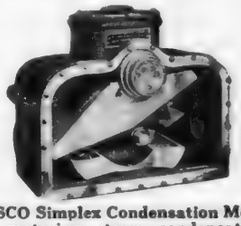
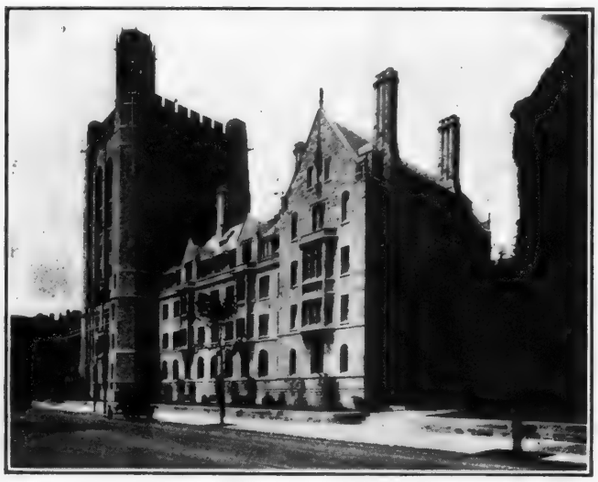
Specialties for Underground or Aerial Steam Mains

High or Low Pressures

EXPANSION JOINTS—METERS—CASING—GATE VALVES—STEAM TRAPS—REDUCING VALVES



ADSCO Simplex Condensation Meter for metering steam condensation. For departmental metering in manufacturing plants, and for accurate metering in District Heating Service. Economical, dependable, efficient.



Yale University Installs Another National—

equips Bingham Hall with Cast Iron instantaneous Coil Type Heater

One hundred and twenty students using 47 lavatories and 37 showers in this new dormitory require plenty of hot water. National Heaters abundantly supply their needs. They heat 1,800 gallons per hour from 40° to 180° with 10-lb. steam pressure.

There are many National heaters in Yale University buildings, none of which we have ever had to replace. Our standards of excellence practiced over a period of 45 years of manufacturing cast iron instantaneous coil type heaters account for their installation in this famous University and many other buildings in all parts of the country.

National heaters are so well constructed that there is practically no servicing required. The tubes and packing stay tight. Thus we frequently hear of National Heaters giving thirty years' continuous service without cleaning.

Let National quote on specifications for your next Coil Type Feed Water Heater.

THE NATIONAL PIPE BENDING CO.

160 River Street *Established 1883* **New Haven, Conn.**

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NATIONAL

Coil Type

Feed Water Heaters

REGULATE PRESSURES

TO SUIT YOUR PLANT NEEDS

When the boiler pressure is too high there is a Davis Pressure Regulator at your service to automatically maintain any lower pressure that efficient operating conditions may require.

Try this well proven valve the next time you have a problem in automatic pressure regulation. Its simple design based on the principle of the balance scale (pressure balanced by counterweights) insures accurate regulation and years of dependable service, without maintenance cost. Time has proven it in thousands of installations under every conceivable condition.

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Balanced Valve Float Valve Steam Trap Back Pressure Valve
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Stop wasteful hand-firing. Install a BROWNELL AUTOMATIC UNDERFEED.

A representative near you

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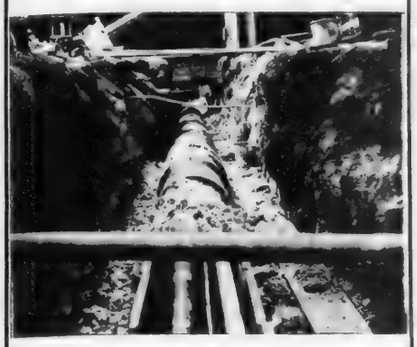
Three Emergencies

And in each one Dry-paC Insulating Filler in Ric-wiL Conduit Exposed to Flood Conditions during Installation, Remained Dry!

1

At Gastonia, N. C.



During a storm in August, one end of the Ric-wiL Conduit installation for the North Carolina Orthopedic Hospital at Gastonia was caught by the rain. Unprotected by backfill, several sections lay practically submerged for nearly two weeks. When the trench was dried out, these sections were opened and examined. It was found that there had been a slight seepage of muddy water part way along the bottom but that over 90% of the Dry-paC was perfectly dry. With ordinary insulation practically the entire line of several hundred feet would have been saturated and ruined.

2

At Gainesville, Fla.

The recent terrible storm in Florida brought 36 hours of rain into several open sections of trench, part of the 4000 feet of Ric-wiL Conduit and Dry-paC insulation that were being installed for the University of Florida at Gainesville. The flood caught six exposed ends of completed conduit; trench walls caved in, mud and water filled the holes.

But when the storm passed and the trenches were cleaned out, it was again found that Dry-paC had stood the test. No water had penetrated any of the conduit beyond the first few inches.

Not merely for emergencies during the installation but for those which may happen later — steam pipe leaks, flooded manholes, etc. — is Dry-paC the guarantee of dryness and efficiency. For moisture will not spread through it, wet it or affect its unusually high efficiency.

Write for complete information

3

At Bayway, N. J.

In August, 1927, a two weeks' rainstorm flooded the territory around New York and held up an installation of Ric-wiL Underground Conduit for The Bayway Terminal Co. The steam pipes were being insulated with Dry-paC waterproof filler. Where work stopped, the conduit end was sealed, but the seal broke and the open end of the conduit lay exposed to rain, part of the time being actually submerged.

When work was resumed, instead of finding the insulation water-logged for a hundred feet or more, as would happen with ordinary filler, the contractor found that even the back end of the first section of conduit was dry. Dry-paC had stopped the water, meeting the emergency and saving expensive repairs.

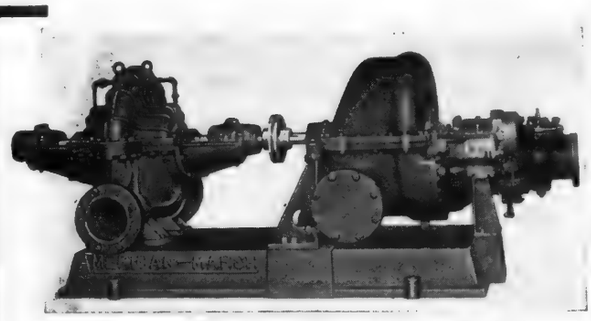
Dry-paC is the final guarantee that the one great enemy of insulation, Moisture, is kept away from your underground steam lines. You cannot afford to plan or install another conduit without complete information about Dry-paC.

Ric-wiL Dry-paC

PATENTS PENDING

The Original Waterproof Conduit Insulating Filler

Manufactured only by The Ric-wiL Company, 1573 Union Trust Bldg., Cleveland, O.



Use HBM Centrifugal Pumps for boiler feed, water supply, pressure boosting, circulating, air washer service, process work, fire service, etc. Built ¾-inch to 16-inch; capacities to 11,000 g.p.m.; heads up to 275 ft.; motor, steam turbine, or belt drive.

New-

yet the Same Proven Quality as of Old

WITH over 25,000 in service, engineers and contractors need no introduction to American - Marsh Single Stage Centrifugal Pumps.

But now these pumps take another long step ahead. Further research, further experimentation covering more than two years, has added extra high operating efficiencies.

Now we call them the *new* HBM Pumps—new because of their new ability, by virtue of higher efficiencies, to save money—cut operating costs to the bone.

Otherwise, however, they are the same as before—same sound, heavy construction—same refinements of design. Prices no higher, even in some cases reduced.

Thus, the *new* HBM Pumps are today's outstanding good pump "buy." We can show you very interesting economies. Write for new Bulletin 38.

AMERICAN STEAM PUMP COMPANY
BATTLE CREEK, MICHIGAN

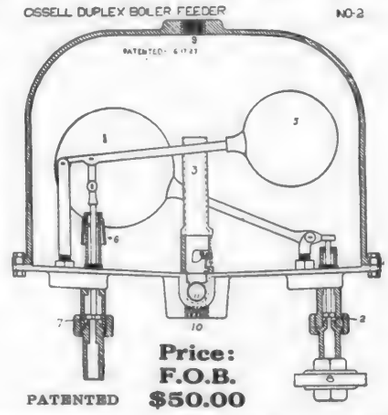
AMERICAN-MARSH

New HBM Centrifugal Pumps

Now is the Time

For Real Boiler Protection

While Also Increasing Its Efficiency



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Price: F.O.B. $50.00

This Duplex feeder, built especially to meet conditions existing in heating boilers, will make your boiler absolutely automatic, eliminating danger of burning boiler or cracking sections. In selecting a boiler feeder you want the best; thousands of these feeders are in use and never a complaint. So sure are we as to its efficiency, that we sell it with an ABSOLUTE GUARANTEE.

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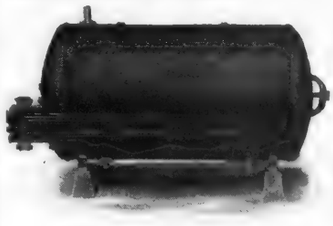
are built for a great variety of standard and special operating conditions for heating water with steam or for the interchange of heat from one liquid to another.



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If you cannot drop in for these sessions, as we cordially invite you to, you can—by tuning in your radio—hear Mr. William Butterworth, President of the Chamber of Commerce of the U. S., speak on "Business Cooperation as a Public Asset." The National Broadcasting Company, recognizing the importance of the conference to business, will broadcast this key address over the stations named below.

The editors of this publication, which is a member of The Associated Business Papers, Inc., believe that you will want to be sure to hear at least Mr. Butterworth's contribution to this important conference.

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Nash Engineering Co., So. Norwalk, Conn
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Vinco Co., Inc., New York.

BOILERS, DOWN-DRAFT
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
National Radiator Corp., Johnstown, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Richmond Radiator Co., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

BOILERS, GAS-FIRED
American Gas Products Corp., New York.
American Radiator Co., Buffalo, N. Y.
Eclipse Fuel Engineering Co., Rockford, Ill.
Frost Mfg. Co., Galesburg, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
National Radiator Corp., Johnstown, Pa.
Richmond Radiator Co., New York.
Stanwood Corporation, Cincinnati, Ohio.

BOILERS, HEATING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Bryan Steam Corp., Peru, Ind.
Burnham Boiler Corp., Irvington, N. Y.
Coatesville Boiler Works, Coatesville, Pa.
Combination Boiler Co., Benton Harbor, Mich.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corporation, New York.
Heggie-Simplex Boiler Co., Joliet, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Monitor Boiler Co., Philadelphia, Pa.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower, Inc., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Peerless Heater Co., Boyertown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Richmond Radiator Co., New York.
Spencer Heater Co., Williamsport, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.
Weil-McLain Co., Chicago, Ill.

BOILERS, MAGAZINE FEED
Gorton Heating Corporation, New York.
Spencer Heater Co., Williamsport, Pa.

BOILERS, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
Combination Boiler Co., Benton Harbor, Mich.
Johnston Brothers, Inc., Ferrysburg, Mich.

BOILERS, POWER
Eclipse Fuel Engineering Co., Rockford, Ill.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Heggie-Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Orr & Sembower, Inc., Reading, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

CALORIMETERS
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.

CIRCULATORS, WATER
Janette Mfg. Co., Chicago, Ill.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Foster Wheeler Corporation, New York.
Heat Transfer Products, Inc., New York
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York
Whitlock Coil Pipe Co., Hartford, Conn.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corporation, New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Heat Transfer Products, Inc., New York
National Pipe Bending Co., New Haven Conn
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa
Spray Engineering Co., Boston, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
Foster Wheeler Corporation, New York.
General Air Filters Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

COPPER BOILERS
Badger & Sons Co., E. B., Boston, Mass.

COPPER KETTLES
Badger & Sons Co., E. B., Boston, Mass.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Banner Rock Products Co., Alexandria, Ind.
Johns-Manville Corp., New York.
Ric-wil, Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT
Buckeye Blower Co., The, Columbus, Ohio.
Clarage Fan Co., Kalamazoo, Mich.

DAMPER LOCKS, SELF-LOCKING
Northern Weatherstrip Co., Duluth, Minn.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

DISTILLERS, (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRAFT APPLIANCES
Draft-A-Justor Corp., Chicago, Ill.
International Fuel Service Corp., Bridgeport, Conn.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Midwest Air Filters, Inc., Bradford, Pa.
Reed Air Filter Co., Inc., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Phila., Pa.

ENGINES, STEAM, AUTOMATIC
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

ENGINES, STEAM, HIGH SPEED
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corporation, New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson, Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST SYSTEMS, ACID
Duriron Company, Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich
Foster Wheeler Corporation, New York.
Fulton Syphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York
Webster & Co., Warren, Camden, N. J

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

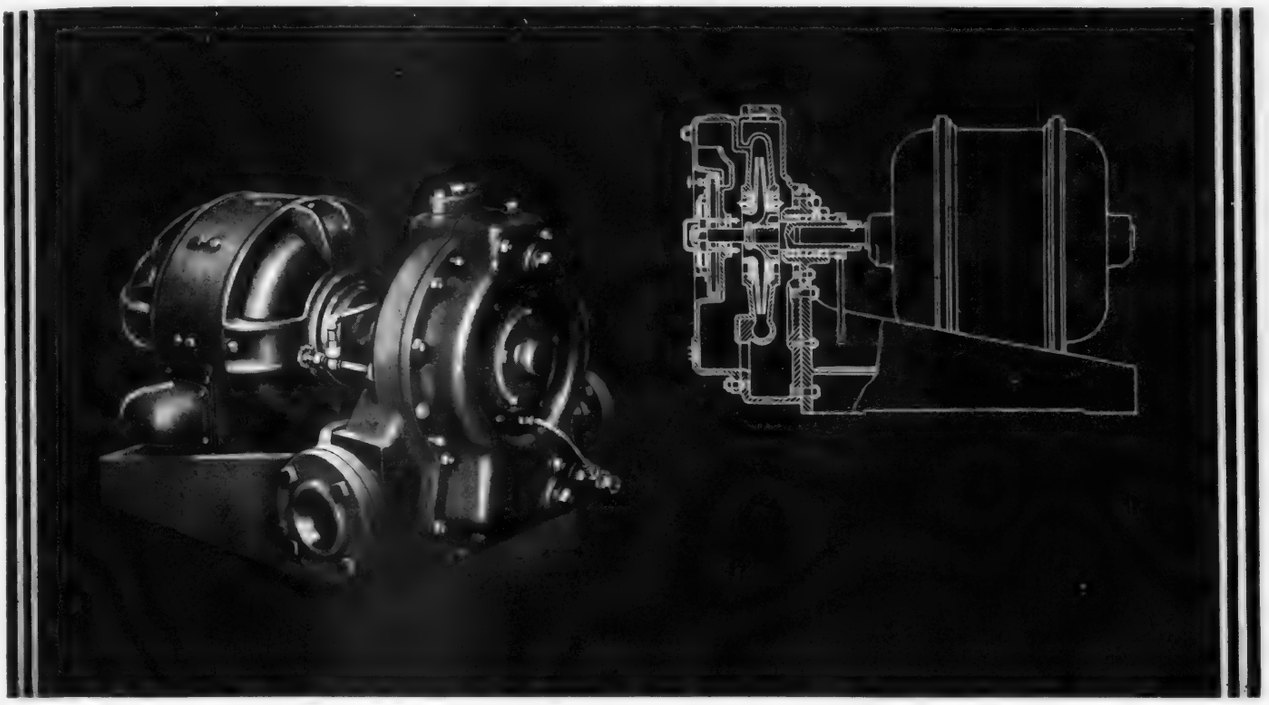
FANS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

FANS, DISC PRESSURE
DeBothezat Impeller Co., Inc., New York.

FANS, SUPPLY AND EXHAUST
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Emerson Electric Mfg. Co., St. Louis, Mo.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Walworth Co., New York.

This centrifugal is self-priming!



External and sectional views of the motor-driven Jennings Suction (Self-Priming) Centrifugal Pump, 2 in. size

Delivers full rated capacity at starting .... without delay

Jennings Centrifugal Pumps are recommended for circulating hot and cold water; boosting city water pressure; handling water in air washing and conditioning; removing condensate from heating systems, blow down from soot blowers and superheaters, exhaust drips from steam ejector air pumps and other auxiliaries; pumping refrigerator can and core water, evaporator feed, cooling tower and condenser water, screen wash water, oil engine jacket water, ash sluicing water.

WHEN the Jennings Suction Centrifugal is started, the built-in Nash Vacuum Pump exhausts the air from the casing and suction piping. Water is quickly drawn into the pump. Full rated capacity is delivered without delay.

Besides this self-priming device, several other features are to be noted in the Jennings design. Motor armature, pump impeller and air rotor are mounted on the same shaft. Alignment is inherent. The only bearings are the two in the motor frame. One stuffing box has been eliminated.

Furnished in 2, 3, 4 and 5 in. sizes for capacities up to 1000 g.p.m. Heads up to 100 ft.

RETURN LINE AND AIR LINE VACUUM HEATING PUMPS ❦ CONDENSATION PUMPS
COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES ❦ STANDARD SUCTION CENTRIFUGAL PUMPS ❦ MARINE PUMPS ❦ SEWAGE EJECTORS ❦ SUMP PUMPS ❦ FLAT BOX PUMPS ❦ HOUSE SERVICE PUMPS

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK CONN.

FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, CRANK CASE OIL
Nugent & Co., Inc., Wm. W., Chicago, Ill.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

FITTINGS, FLANGED
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York

FLANGES
Clow & Sons, James B., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.

GASKETS, ASBESTOS
Jenkins Bros., New York.
Johns-Manville Corp., New York.

GASKETS, METALLIC
Jenkins Bros., New York.

GASKETS, RUBBER
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Clow & Sons, James B., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Jenkins Bros., New York.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.

GAUGES, DRAFT
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, TANK
King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Corp., New York
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Inc., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS, (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio
Titusville Iron Works Co., The, Titusville, Pa

GRATES, ROCKING
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.
Pyramid Iron Products Corp., New York.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

HEAT CABINETS
Circulair Heat, Inc., Louisville, Ky.
Clow & Sons, James B., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Metal Stamping Co., Long Island City.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill
Reed Air Filter Co., Inc., Louisville, Ky.
Trane Co., The, LaCrosse, Wis.

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Foster Wheeler Corporation, New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., The, Erie, Pa.
Taco Heaters, Inc., New York.
Titusville Iron Works Co., The, Titusville, Pa.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corporation, New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER, (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Heat Transfer Products, Inc., New York
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Taco Heaters, Inc., New York.
Titusville Iron Works Co., The, Titusville, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

HEATING SYSTEMS, GAS
Clow & Sons, James B., Chicago, Ill.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Spencer Heater Co., Williamsport, Pa.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spencer Heater Co., Williamsport, Pa
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm. H., New York
Ross Heater & Mfg. Co., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa
Thrush & Co., H. A., Peru, Ind.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York
General Air Filters Corp., New York
Grinnell Co., Providence, R. I.
Heat Transfer Products, Inc., New York
Johnson Service Co., Milwaukee, Wis
Midwest Air Filters, Inc., Bradford, Pa
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Phila., Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

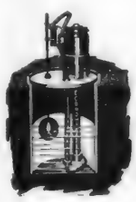
INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING
Banner Rock Products Co., Alexandria, Ind.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.
Johns-Manville Corp., New York.

MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass

"As for Pumps, we can leave that to Economy"

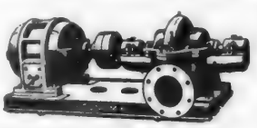


Automatic Sump Pump

When it comes to the pump requirements of the new project, you will find Economy's special knowledge and facilities useful.

Pumping problems that are rarely met in your business are continually faced by a firm, such as ours, that specializes in them. Our data, therefore, may be useful to your superintendent or estimator. It is at his disposal, and suggestions will be freely offered.

Economy has pioneered in the field of pumping equipment for 21 years, and its design are in advance of the times. Whether you merely invite our suggestions, or leave the entire problem in our hands, you may be assured that the finished installation will be beyond reproach.



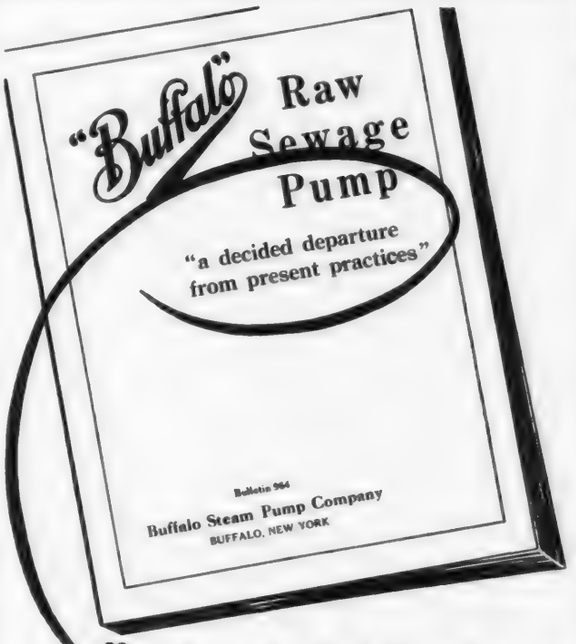
General Service Single Stage Centrifugal Pump

Special bulletins on all types of pumps—for water supply, sewage disposal, boiler feeding or heating—available on request. A postcard brings one.

Economy Pumping Machinery Company
3431 West 48th Place, Chicago

Representatives in Principal Cities—Telephone and address under Economy Pumping Machinery Co.

Economy Pumps



"a decided departure from present practices"

Write into your specifications, whether for vertical or horizontal raw sewage pumps this sentence: "this pump must be guaranteed by the manufacturer against clogging."

We will give you this guarantee and it is backed by the reputation and all of the resources of this company.

RATING TABLE

Pump No.	*Will Pass Sphere Inches Diameter*
4	3
6	4
8	6
10	8
12	10

The Buffalo Raw Sewage Pump has won the approval of the best pump engineering minds of the country. If you have not seen a copy of Bulletin No. 964-A, send for one today. It tells the complete story.

Engineering offices in all principal cities at your service

Buffalo Steam Pump Co.

480 Broadway **Buffalo, N. Y.**

In Canada:
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Better Pumps Since 1887

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Mason Regulator Co., Boston, Mass.
New York Blower Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Sturtevant Co., B. F., Hyde Park Boston, Mass.
Wing Mfg. Co., L. J., New York.

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.
Spray Engineering Co., Boston, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Builders Iron Foundry, Providence, R. I.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
American Nokol Corp., Chicago, Ill.
Caloroil Burner Corp., New York.
Cleveland Steel Products Corp., Cleveland, Ohio
Electrol, Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
McIlvaine Burner Corporation, Chicago, Ill.
Nu-Way Corporation, Rock Island, Ill.
Pascoe Company, The Wm. H., Chicago, Ill.
Petroleum Heat & Power Co., New York.
Preferred Oil Burners, Inc., Peoria, Ill.
Winslow Boiler & Engineering Co., Chicago, Ill.

OIL BURNER EQUIPMENT
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Draft-A-Justor Corp., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
Schutte & Koerting Co., Philadelphia, Pa.
Webster Electric Co., Racine, Wis.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Webster Electric Co., Racine, Wis.

PIPE, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

PIPE, CAST IRON
Clow & Sons, James B., Chicago, Ill.

PIPE, STEEL
Clow & Sons, James B., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PIPE, WOOD
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Walworth Co., New York
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.
Wyckoff & Son Co., A., Elmira, N. Y.

PIPE HANGERS
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York

PIPE THREADING & CUTTING MACHINES
National Pipe Bending Co., New Haven, Conn.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED
Horton Mfg. Co., Minneapolis, Minn.

PUMPS, ACID RESISTING
Duriron Company, Inc., The, Dayton, O.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, New York.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.
Weil Pump Co., Chicago, Ill.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Weil Pump Co., Chicago, Ill.

PUMPS, CONDENSATION
American Steam Pump Co., Battle Creek, Mich.
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Weil Pump Co., Chicago, Ill.

PUMPS, OIL
Connor Co., Inc., The W. B., New York.
Janette Mfg. Co., Chicago, Ill.
Nugent & Co., Inc., Wm. W., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Economy Pumping Machinery Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Weil Pump Co., Chicago, Ill.

PUMPS, TURBINE
Chicago Pump Co., Chicago, Ill.
Foster Wheeler Corporation, New York.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Weil Pump Co., Chicago, Ill.

RADIATOR ENCLOSURES OR SHIELDS
Acme Radiator Shield Co., Cincinnati, Ohio.
American Metal Products Corp., St. Louis, Mo.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.

RADIATORS, BRASS
Circulair Heat, Inc., Louisville, Ky.
Rome Brass Radiator Corp., New York.
Shaw-Perkins Mfg. Co., Pittsburgh, Pa.

RADIATORS, GAS HEATED
Automatic Gas Steam Radiator Co., Pittsburgh, Pa.
Clow & Sons, James B., Chicago, Ill.

RADIATORS, STEAM & WATER
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Clow & Sons, James B., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York
Richmond Radiator Co., New York.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Connor Co., Inc., The W. B., New York.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Cissell Mfg. Co., W. M., Louisville, Ky.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Draft-A-Justor Corp., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Syphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Teeple Co., L. R., Portland, Oregon

REGULATORS, TEMPERATURE
(See Temperature Control).

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray).

STRAINERS, OIL
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Nugent & Co., Inc., Wm. W., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

TEMPERATURE CONTROL
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Syphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mercoid Corporation, Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Raymond, F. I., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Sterling Engineering Co., Milwaukee Wis.
Teeple Co., L. R., Portland, Oregon
Thrush & Co., H. A., Peru, Ind.
Time-O-Stat Corp., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

THERMOMETERS, RECORDING & INDICATING
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York

H.T.P.

HEAT TRANSFER PRODUCTS

Designers and builders of general engineering equipment for

Power Plants — Refrigeration Plants
Chemical Plants — Air Conditioning
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Textile Mills — Paper Mills, etc.

Also equipment for severe duty such as high pressures, high temperatures and unusual corrosive conditions . . .
Complete engineering service furnished on any problem in these industries.

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A Division of the
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90 West Street, New York, N.Y.

THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures up to 450° F.
Our No. 2800 metal for temperatures up to 1500° F.

Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
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Detroit, Michigan

ROSS

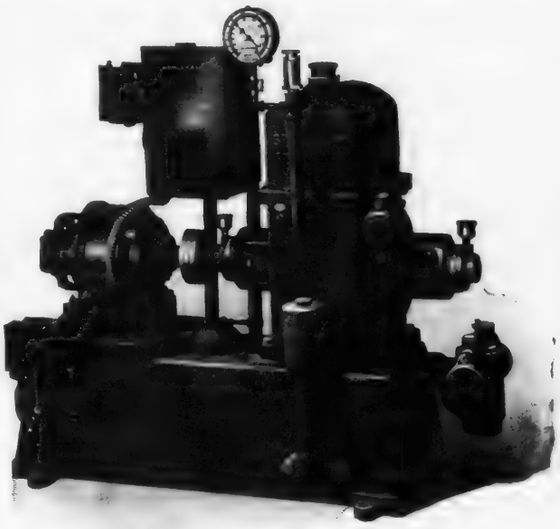
Crosshead-
GUIDED
Expansion Joint
Excels in

Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.

New York, Chicago, Philadelphia, Boston, Cleveland, St. Louis, Detroit, Pittsburgh, Baltimore, San Francisco, Seattle, Denver, Salt Lake City, Omaha, Montreal, Toronto.

SKIDMORE



Which Will You Have

high or low water line in the system when operating on float control?

The Skidmore pump on interceptor base is designed to give low water line operation without pitting.

The unit is self contained, ball bearing, and operated by one motor. It produces vacuum on the system even when operating on float control, a desirable feature.

The unit consists of two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed. Motor and pump are mounted directly on interceptor base. This construction means compactness in design and minimum floor space occupied.

The automatic starter together with vacuum regulator and float switch are mounted on this unit. All wiring is installed at the factory.

Bulletin No. 5 illustrating this unit is now available.

SKIDMORE CORPORATION
General Offices and Factory
1535 Dayton St. CHICAGO, U.S.A.
Representatives in principal cities
Canadian Representatives, Darling Bros., Limited
120 Prince Street, Montreal

Powers Regulator Co., Chicago, Ill.

THERMOSTATS

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Johnson Service Co., Milwaukee, Wis.
Mercoid Corporation, Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Thrush & Co., H. A., Peru, Ind.
Time-O-Stat Corp., Milwaukee, Wis.

TRAPS, BUCKET

Trerice Co., H. O., Detroit, Mich.

TRAPS, FLOAT

Connor Co., Inc., The W. B., New York.
General Air Filters Corp., New York.
Sarco Co., Inc., New York.

TRAPS, FLOAT & THERMOSTATIC

Dunham Co., C. A., Chicago, Ill.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Works, Three Rivers, Mich.

TRAPS, LIFTING

Lytton Mfg. Corp., Franklin, Va.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Works, Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johns-Manville Corp., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Clow & Sons, James B., Chicago, Ill.
Connor Co., Inc., The W. B., New York.
Davis Engineering Corp., New York.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
General Air Filters Corp., New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Corp., New York.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Trerice Co., H. O., Detroit, Mich.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNDERGROUND PIPE CONDUITS

American District Steam Co., North Tonawanda, N. Y.
Johns-Manville Corp., New York.
Ric-wil Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Duriron Company, Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Kelly Brass Works, Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Russell & Co., W. A., New York.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Gorton Heating Corporation, New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Stay-Rite Co., Inc., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York

VALVES, BALANCED

Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, BLOW-OFF

Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York

VALVES, CHECK

Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Milwaukee Valve Co., Milwaukee, Wis.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Phila., Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Walworth Co., New York

VALVES, MAGNETIC

Absolute Con-Tac-Tor Corp., Elkhart, Ind.

VALVES, NON-RETURN

Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Capitol Brass Works, Detroit, Mich.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Stay-Rite Co., Inc., Cleveland, Ohio.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Walworth Co., New York
Webster & Co., Warren, Camden, N. J.

VALVES, REDUCING

(See Regulators, Pressure).

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Kainer & Company, Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.
Thrush & Co., H. A., Peru, Ind.

VALVES, SAFETY

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Division, Consolidated Ashcroft Hancock Company, Inc., Brooklyn, N. Y.
Jenkins Bros., New York.
National Radiator Corp., Johnstown, Pa.
Stay-Rite Co., Inc., Cleveland, Ohio.
Walworth Co., New York

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark N. J.
Clarage Fan Co., Kalamazoo, Mich.
Connor Co., Inc., The W. B., New York
General Air Filters Corp., New York
Lakeside Company, The, Hermansville, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Skinner Bros. Mfg. Co., St. Louis Mo.
Sturtevant Co., B. F., Hyde Park Boston, Mass.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS, ACID

Duriron Company, Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
DeBothezat Impeller Co., Inc., New York
Midwest Air Filters, Inc., Bradford Pa.
Sturtevant Co., B. F., Hyde Park Boston, Mass.

VENTILATORS, MUSHROOM

Aeolus Dickinson, Chicago, Ill.
American Blower Co., Detroit, Mich
American Metal Products Corp., St Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill

VENTILATORS, ROOF

Aeolus Dickinson, Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich
Nelson Corp., Herman, The, Moline Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Hyde Park Boston, Mass.

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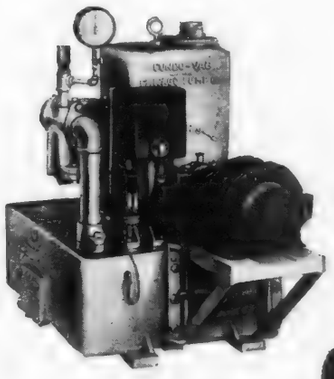

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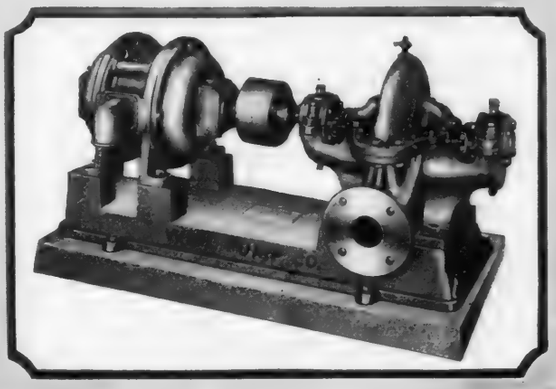

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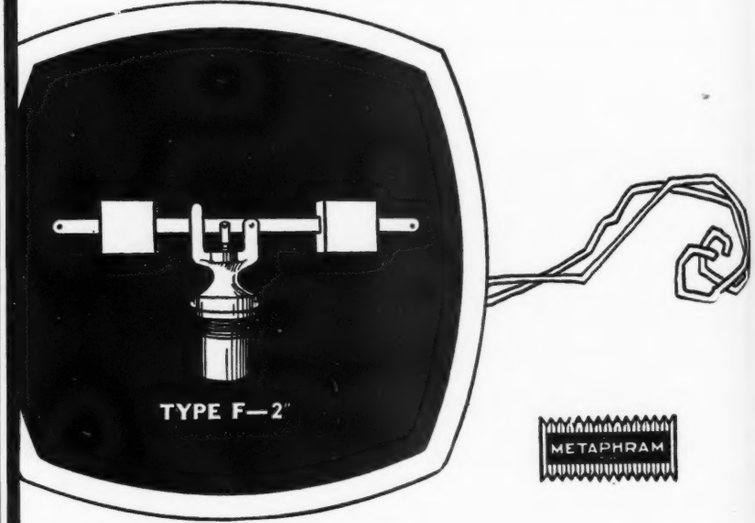

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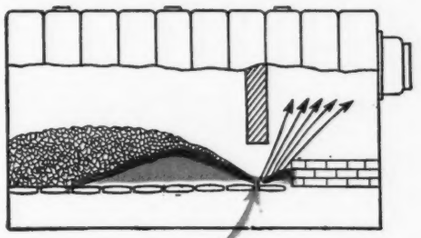

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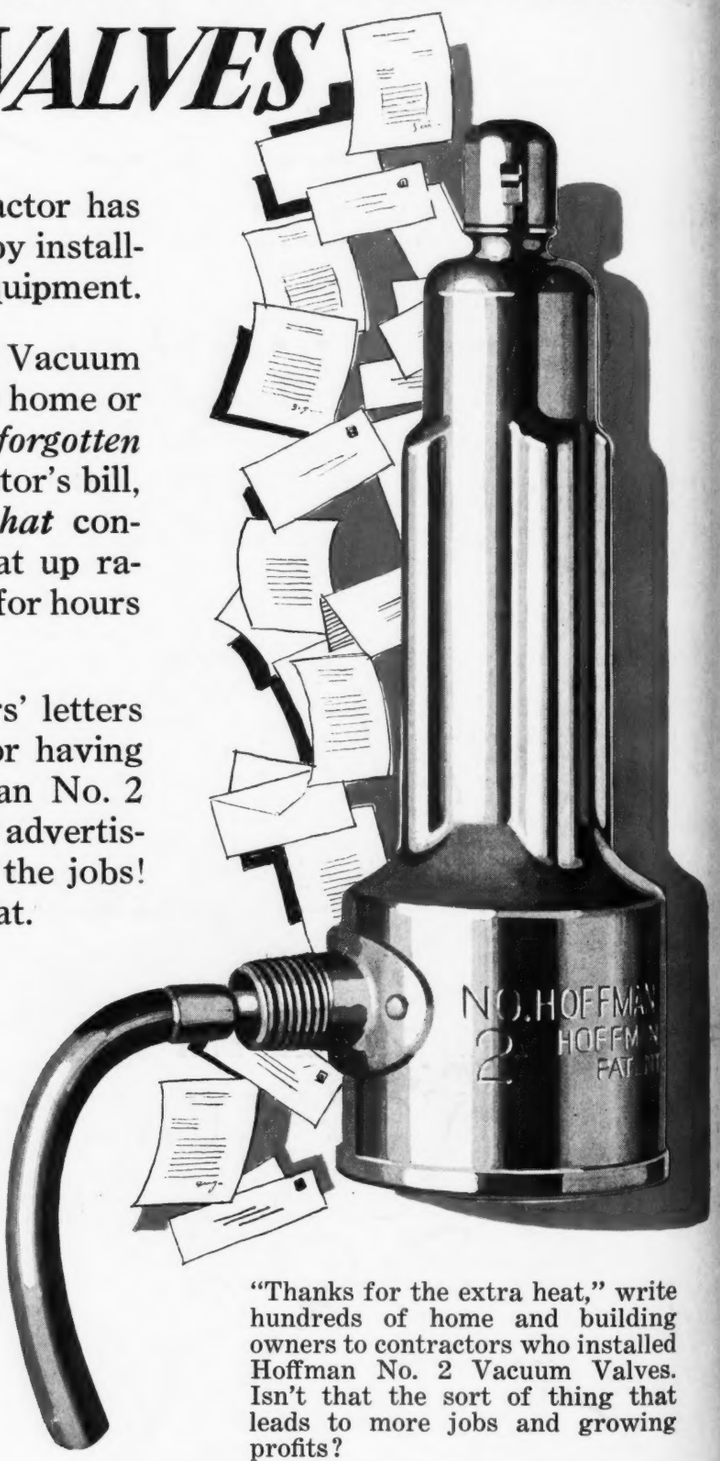

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